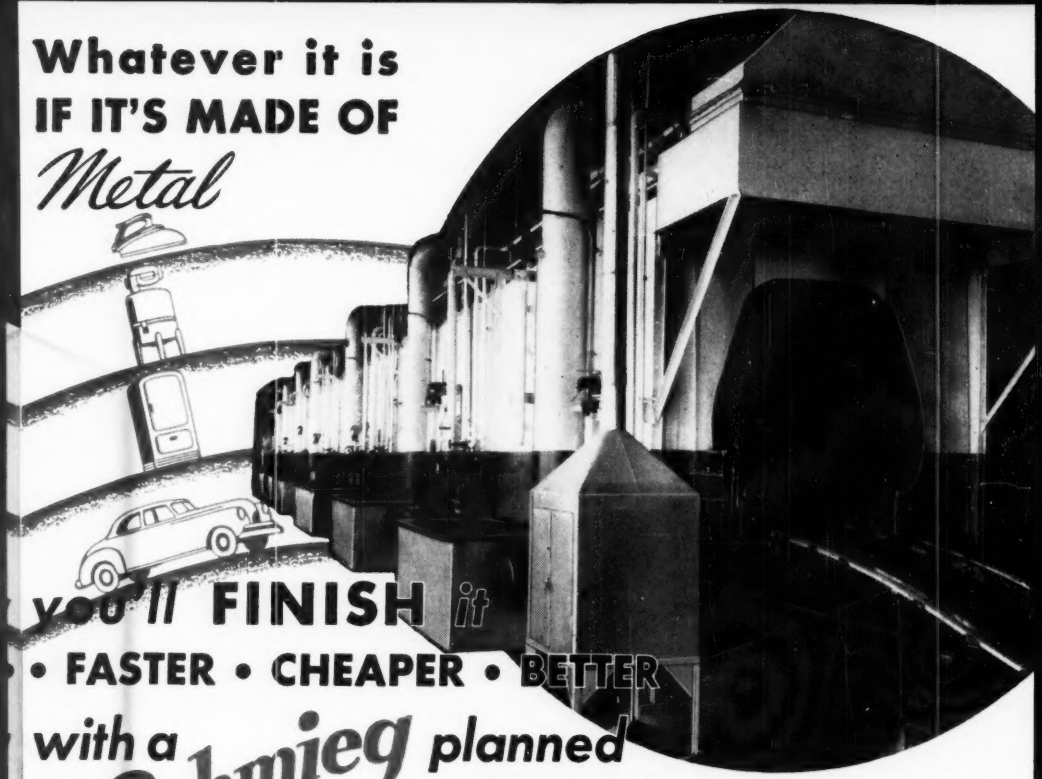
Products Finishing

CLEANING
PLATING
POLISHING
FINISHING

AUGUST 1950

Whatever it is IF IT'S MADE OF *Metal*



you'll FINISH *it*

• FASTER • CHEAPER • BETTER

with a Schmieg *planned*

CENTRI MERGE FINISHING SYSTEM

FINISHING has a highly important bearing on the sale of your product if APPEARANCE is a factor in its acceptance. Obsolete, inadequate finishing equipment improperly laid out, not only makes for inefficient finishing and consequent poor appearance—it materially adds to manufacturing cost.

Equipment for metal washing, rustproofing, dry-off, spray painting, baking, as developed by Schmieg engineers, is planned precisely for your plant and product—coordinated into a speedy, smooth-flowing production unit that saves time—space—and operating expense. Schmieg has the years of engineering experience, knowledge of modern methods and the facilities for seeing the job through—from initial designs to completed machines, set up and ready to operate in your plant.

Our engineers will be pleased to consult with you in the solution of your problem.

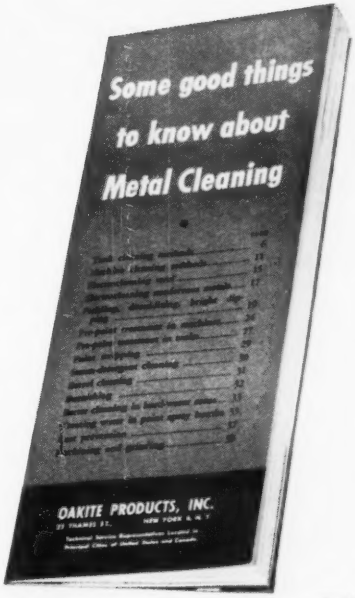
THE *best* AIR PURGE *is* CENTRI MERGE

Schmieg INDUSTRIES INC.

Engineers & Manufacturers

3114 PIQUETTE AVENUE DETROIT 2, MICHIGAN

Which of your metal-cleaning jobs would you like to improve?



Listed below are some of the operations discussed in Oakite's new 44-page illustrated booklet on Metal Cleaning. Please check the list. Then let us show you how Oakite materials and methods can give you better production with greater economy.

OAKITE PRODUCTS, INC., 20 Thames St., New York 6, N. Y.

Tell me (without obligation on my part) about Oakite methods and materials for the following jobs:

- ☐ Tank cleaning
- ☐ Machine cleaning
- ☐ Electrocleaning
- ☐ Pickling
- ☐ Pre-paint treatment
- ☐ Paint stripping
- ☐ Steam-detergent cleaning
- ☐ Barrel cleaning
- ☐ Burnishing
- ☐ Rust prevention
- ☐ Send me a FREE copy of your booklet "Some good things to know about Metal Cleaning"

NAME.....

COMPANY.....

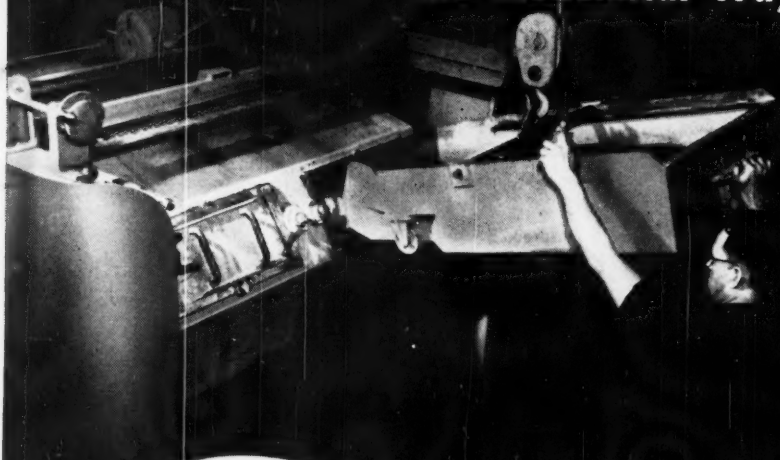
ADDRESS.....

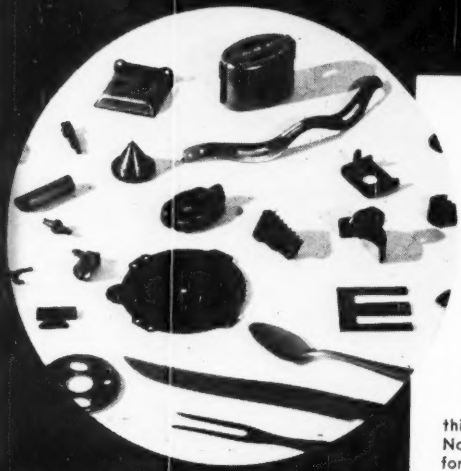
Technical Service Representatives in Principal Cities of U. S. & Canada

OAKITE SPECIALIZED INDUSTRIAL CLEANING MATERIALS • METHODS • SERVICE

TRADE MARK REG. U. S. PAT. OFF.

Are You Finishing Your Metal Parts *the Economical Way?*





YOU can remove objectionable heat scale, burrs, tool marks and dirt from your metal parts quickly and economically with the barrel finishing process and with ALUNDUM Tumbling Abrasive—the ideal barrel finishing medium. You can finish large quantities of parts to exact dimensions and degrees of surface finish and prepare them for plating — ALL IN ONE OPERATION!

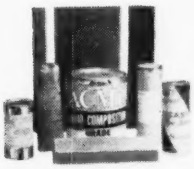
If you don't have barrel finishing equipment in your plant, and if you would like to find out without obligation what this finishing process and this Norton product can do for you — Norton will be glad to make test runs for you.

NORTON COMPANY, WORCESTER 6, MASS.

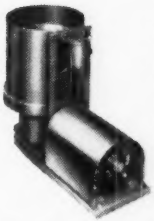
Distributors In All Principal Cities

G-221

NORTON
ABRASIVES



The biggest factor in buffing compounds is selecting the one exactly right for the job. Compounds, not buffs, should do the work for economical buffing. Be sure the compound you use adheres to the wheel as long as the abrasive retains its cutting power and you get maximum color per degree of cut. Check on clean working properties and easy solubility in cleaning solutions. H-VW-M makes *all* types of buffing compounds . . . hand or automatic, bar or liquid. Bulletin BC-104 describes them in detail.



Before you buy a centrifugal dryer, be sure it's compact, built for trouble-free service. Be sure of minimum vibration; that the unit can be set next to the plating barrel to simplify transfer. Be sure the motor control is a reversing, drum type switch; that it allows the operator to start, stop or reverse the turntable at will. Be sure the shaft is supported by roller bearings of ample size. All these and more are built into H-VW-M Mercil Type Centrifugal Dryers. Ask for Bulletin CD-101.

In buying burnishing barrels, be sure you get ALL the features that mean efficient operation and low maintenance. Look for a direct-connected drive, a completely protected motor . . . for roller bearings that assure proper alignment and load support. Be sure the internal gear is fastened to the bottom of the burnisher from the outside, eliminating need for removing lining blocks when gear or shaft change is necessary. These "plus factors" of H-VW-M Mercil Type Burnishing Barrels are detailed in Bulletin BB-104.

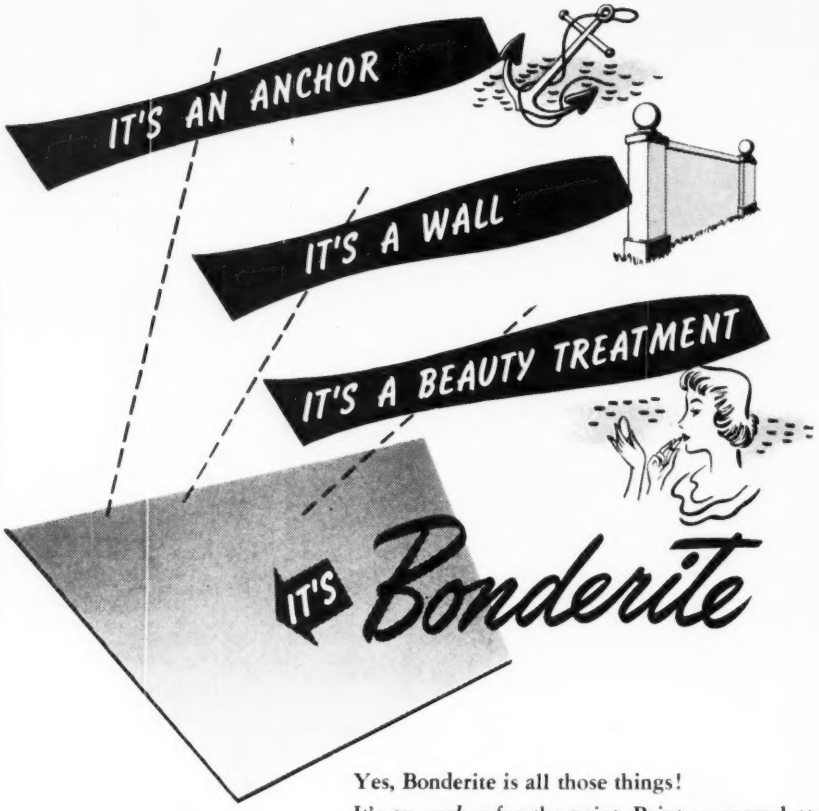
You're sure of all the "plus factors" when you remember . . . you can always get what you want from H-VW-M when you want it . . . H-VW-M products are strategically warehoused for prompt service and delivery . . . H-VW-M sales-engineers and laboratory technicians are always available for help in your production problems. It is this overall service and experience that have made H-VW-M *the central source of supply . . . for over 80 years . . . for all the needs* of the electroplating and polishing industry.

HANSON-VAN WINKLE-MUNNING COMPANY, Matawan, N. J.
Plants at: Matawan, N. J. • Anderson, Indiana • *Sales Offices:* Anderson • Chicago • Cleveland • Dayton • Detroit • Grand Rapids Matawan • Milwaukee • New Haven • New York • Philadelphia Pittsburgh • Rochester • Springfield (Mass.) • Stratford (Conn.) • Utica

H-VW-M

6347

Manufacturers of a complete line of electroplating and polishing equipment and supplies



Learn what Bonderite can do for your product. Write today for full information.

Yes, Bonderite is all those things!

It's an *anchor* for the paint. Paint or enamel applied over Bonderite has a secure foothold. It stoutly resists peeling and flaking.

It's a *wall,* resisting the attacks of moisture and corrosive forces.

It's a *beauty treatment!* Bonderite, under the paint, acts to preserve and protect the appearance of the finish through long service.

It is a product improvement used on hundreds of metal products as a corrosion-resistant paint base.

Bonderite is a *sales-feature,* too. Buyers know and appreciate the value of this paint-holding process.

Bonderite, Parco, Parco Lubrite—Reg. U. S. Pat. Off.

PARKER

PARKER RUST PROOF COMPANY
2172 East Milwaukee Ave.
Detroit 11, Michigan

BONDERITE—Corrosion Resistant Paint Base • PARCO COMPOUND—Rust Resistant • PARCO LUBRITE—Wear Resistant for Friction Surfaces

EZRA A. BLOUNT, *Editor*

ROBERT I. SHORE
Associate Editor

Consulting and Contributing Editors
H. LEROY BEAVER
ALLEN G. GRAY
BRYANT W. POCOCK

GENE J. SCHWARBER
Advertising Manager

NORMAN S. ROGERS
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ADVERTISING REPRESENTATIVES

RICHARD S. KLINE
GEORGE E. HAY
431 Main St., Cincinnati 2
MAin 0182

G. M. FILLMORE
342 Madison Ave., New York 7
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THE ROBERT W. WALKER CO.
684 S. LaFayette Park Place
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CCA NBP

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Products finishing

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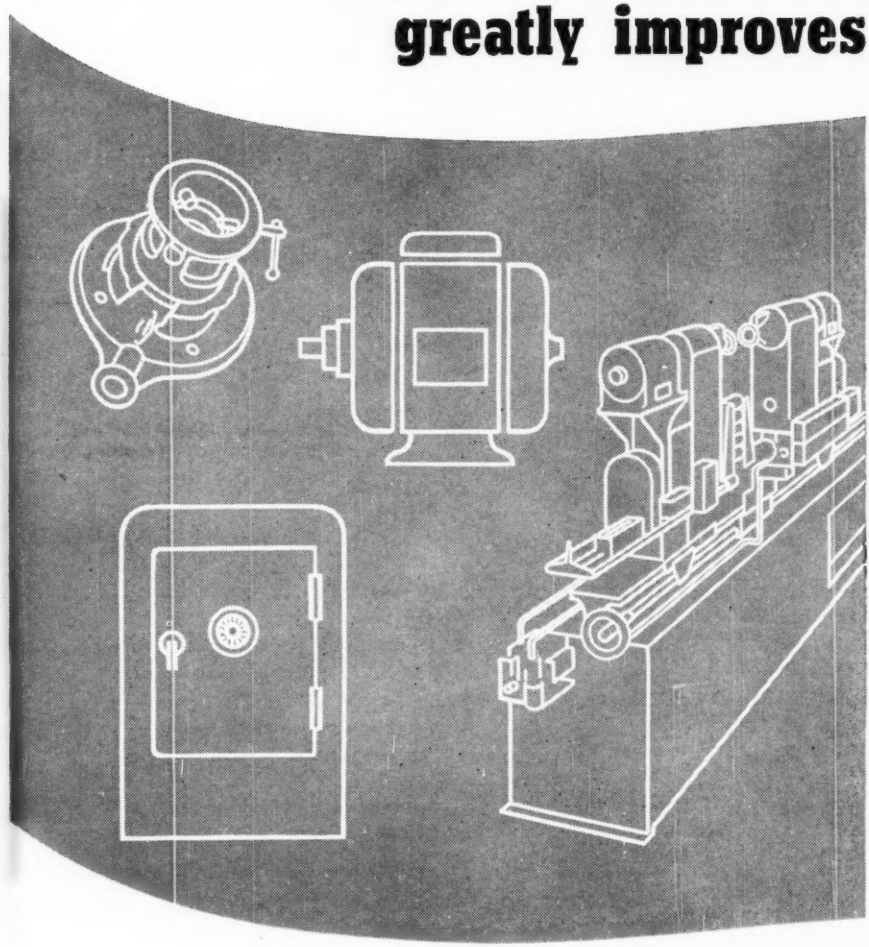
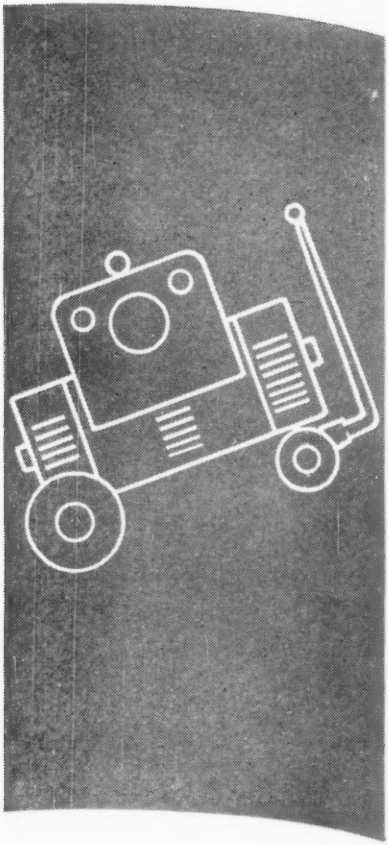
LOWE BROTHERS
greatly improves



✻ Here, the Lowe Brothers "Finishing Specialist" recommended "Lowemac"—a new, fast-drying Synthetic Enamel now replacing slow drying enamels and lacquers. "Lowemac" is now doing the same kind of efficient job for makers of machine tools, motors, safes, pipe threaders, water pumps and fan bases. The consistent high quality of Lowe Brothers Industrial Finishes is your complete assurance of the finest in finishing results for *your* particular product.

"FINISHING SPECIALIST"

appearance of product and reduces material costs!



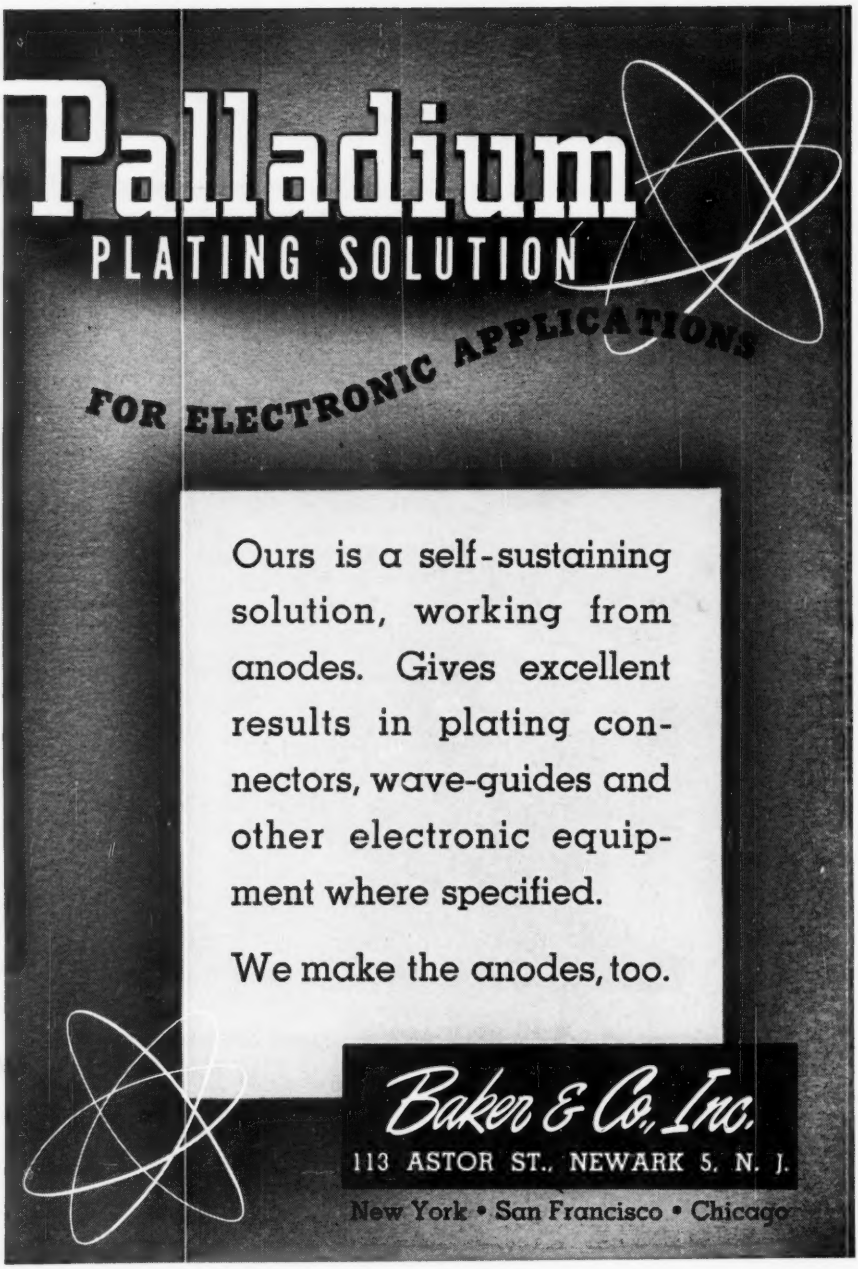
. . . Another Result of Lowe Brothers Continuing Program of complete and thorough Industrial Finishing Service!

This well-known welder manufacturer was using a lacquer finish. A Lowe Brothers "Finishing Specialist" pointed out that an enamel would give the finished products a brighter, more attractive appearance. This called for an enamel which would set up fast enough that production would not be curtailed. A special, fast-drying Synthetic Enamel* was recommended by the "Finishing Specialist." Result—in the *approximate* finishing time previously required, *and at a reduced material cost* — this manufacturer was able to greatly improve the appearance of his product!

. . . One of many similar cases where the knowledge and experience of a Lowe Brothers "Finishing Specialist" have helped to increase a product's sales appeal *without* increasing production time or expense. Plan now to have a Lowe Brothers "Finishing Specialist" check *your* finishing methods. There's no cost or obligation connected with this service. Write today.

THE LOWE BROTHERS COMPANY • DAYTON 2, OHIO

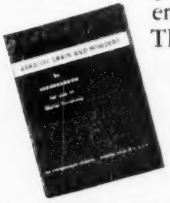
This advertisement is based on facts from the Lowe Brothers Industrial Case History Files.


Palladium
PLATING SOLUTION
FOR ELECTRONIC APPLICATIONS
Ours is a self-sustaining solution, working from anodes. Gives excellent results in plating connectors, wave-guides and other electronic equipment where specified.
We make the anodes, too.
Baker & Co., Inc.
113 ASTOR ST., NEWARK 5, N. J.
New York • San Francisco • Chicago

ALOXITE TPC Grain

TPC aluminum oxide grain is being applied successfully in a wide variety of operations in plants where production doesn't warrant use of several grain types.

TPC grain is specially treated to assure maximum adhesion when used with cold cements. This saves preparation time and eliminates glue pots in shops where it is not practical to make up several batches of glue daily. TPC grain has a medium-fast cutting rate on all metals. Available in all standard grit sizes, 16 through 220.



TPC grain and its applications, as well as those of other polishing grains by CARBORUNDUM, are explained in detail in a new booklet which may be obtained from one of our qualified representatives . . . or by writing direct. Bonded Products and Abrasive Grain Division, The Carborundum Company, Niagara Falls, New York.

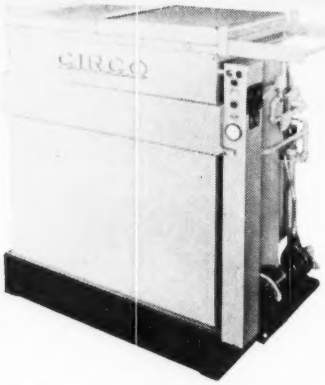
POLISHING GRAIN by

CARBORUNDUM

TRADE MARK

"Carborundum" and "Aloxite" are registered trademarks which indicate manufacture by The Carborundum Company

Can You Afford Outmoded Metal Parts Cleaning?



A CIRCO engineered degreaser gives you

1. Thorough and speedy parts cleaning
2. Safe operation—uses a nonflammable, non-explosive solvent
3. Economy of operation
4. Long life with stainless clad, nickel clad or zinc sprayed construction.

Before and after nearly every production operation in the metal working industry, a cleaning operation must be performed. Are you risking high production costs with outmoded cleaning methods?

Circo vapor-spray degreasers eliminate costly, hand-labor operations. *Savings of over 90% in time alone are common.* Not only is valuable time saved but better cleaning is assured. Warm vapor, harmless to all metals, thoroughly penetrates every crack or seam. All traces of dirt, oil and grease are absolutely removed, leaving each part ready for immediate inspection. Depending on size, parts can be removed, *absolutely clean and dry,* in 1 to 15 minutes. Best of all, Circo's fully automatic control system guarantees operating economy.

CIRCO DEGREASERS PAY FOR THEMSELVES

For detailed information send for our catalog covering our standard degreasers. Our engineers will gladly work with you on metal cleaning problems requiring equipment of special design. A-3050

CIRCO

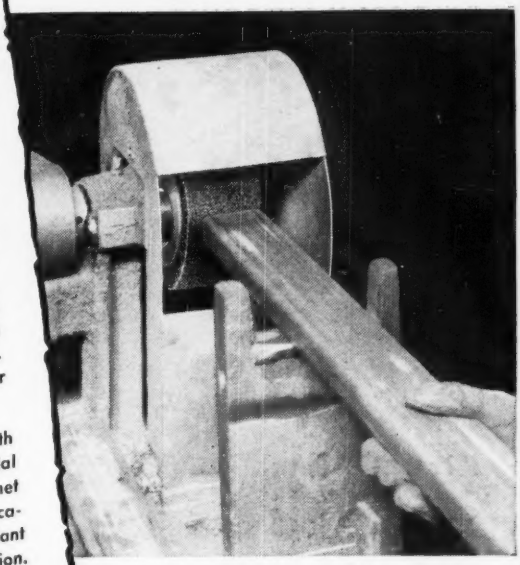
CIRCO PRODUCTS COMPANY
Metal Cleaning Equipment
6531 EUCLID AVE. • CLEVELAND, OHIO

PIONEERS IN THE DEVELOPMENT OF HOT VAPOR CLEANING EQUIPMENT

National Electric Said . . . Make it STIFF, TOUGH, RUGGED!

When National Electric Products Corp. put their brushing problems in the lap of Pittsburgh's skilled brush engineers, they requested a special brush for rough duty. It had to be **stiff** enough to remove burrs and scales . . . **tough** enough to penetrate and clean . . . **rugged** enough to stand up under heavy operation at high speed.

Pittsburgh engineers came up with the right answer in a special power driven brush that met each National Electric specification . . . and increased plant efficiency, stepped up production.



You Can Depend on "Pittsburgh" to Solve Your Brush Problems

WE have brushes of all types in the complete Pittsburgh line which should comply with your specific needs . . . whether you're in glass, steel or plastics . . . in paper, tires, shoes or automobiles . . . because there's a Pittsburgh brush for every industrial use.

But if you have special problems, our staff of skilled brush engineers will be glad to design and build any type of power-driven brush to meet your particular specifications. What's more, they'll do it quickly, efficiently and economically.

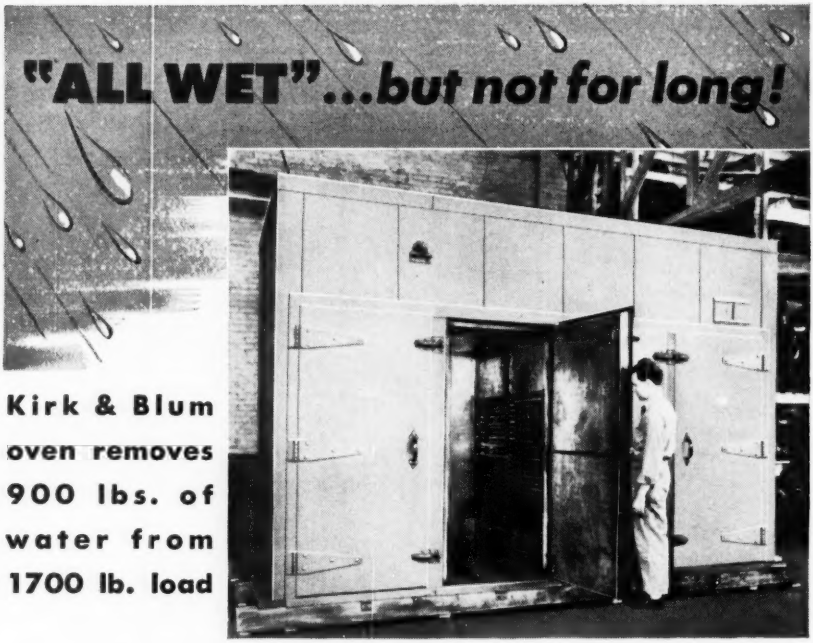
For information about our stock power brushes, write or telephone PITTSBURGH PLATE GLASS COMPANY, *Brush Division*, Dept. W-6, 3221 Frederick Ave., Baltimore 29, Md. Or tell us what your problem is, and let one of our engineers work out a solution for you. There is no obligation.

PITTSBURGH *Power Driven* **BRUSHES**

BRUSHES • PAINT • GLASS • CHEMICALS • PLASTICS

PITTSBURGH PLATE GLASS COMPANY

"ALL WET"...but not for long!



Kirk & Blum oven removes 900 lbs. of water from 1700 lb. load

... at Tennessee Eastman Corporation, Kingsport, Tenn.

Special design insures removal of moisture as it is taken up by the warm air, preventing redeposit on other trays.

Steam heated, with adjustable controls and air circulating system for each compartment, the oven receives moisture-laden chemicals in trays, on trucks.

This 4-compartment feature allows removal of any truck at any time.

This 4-compartment dehydrating oven is another example of the wide diversification of drying problems solved by KIRK & BLUM Engineers.

The oven was shipped from the KIRK & BLUM plant completely assembled, thoroughly tested and ready to operate exactly as shown.

If you have an oven problem, discuss it with a KIRK & BLUM Engineer. There's no obligation. Write for free booklet, "Industrial Ovens."

KIRK AND BLUM

INDUSTRIAL OVENS

The Kirk & Blum Mfg. Co.
2816 Spring Grove Ave.,
Cincinnati 25, Ohio

DO ALL OF THESE PARTS WITH "ONE OPERATION" MASS PRODUCTION FINISHING

AT A COST SAVING OF UP TO 95% WITH

ALMCO **Supersheen**

A Better Finish-FASTER

EQUIPMENT FOR YOUR SPECIFIC NEEDS

(1) Advanced Design PRECISION Tumbling barrels in sizes from 8" x 16" up to 60" x 30". (2) AUTOMATIC loading, unloading and separating equipment. (3) A vastly SUPERIOR grinding and finishing medium in 2 grades and 9 sizes.

DEBURR

Flat or formed stampings — **all** types and sizes . . . long, thin, slotted, etc. All common metals, including magnesium and copper. Machined parts with large burrs. Large, heavy or extremely light parts can be "one operation" processed without damage.

CUTTING DOWN, POLISHING, BURNISHING, PUTTING ON RADIUS

Castings — **all** types — **all** common metal alloys. Forgings before and after machining. Machined parts. Stampings requiring smooth surfaces and high colors.

DESCALE, DEBURR, POLISH

Forgings before and after machining. Heat treated parts. Welded or discolored parts.

COMPLETELY FINISH FROM CASTING OR FORGING TO PLATING OPERATION

Forged or cast brass, iron. Die castings of all sizes, shapes and types.

ALSO

Selective grinding. Low micro-inch surfaces equal to lapped finishes can also be obtained with absolute uniformity.

● GET THESE BENEFITS

A Better Finish Faster on widest range of parts. Reduced time, labor and material costs . . . **up to 95% saving!** Reduced rejections — stepped-up production. Unsurpassed uniformity — improved finish.

● OUR SERVICE TO YOU

We survey your requirements — determine by Trial Runs if ALMCO SUPERSHEEN is applicable. Furnish Engineering Data Card — specific fool-proof instructions on how to run each part. Train operators for highest efficiency. Furnish continuing information on latest finishing procedures.

FREE *Engineering Clinics*

Nationwide Network provides you with QUICKER and BETTER sample processing. Write today for details — or send unfinished samples for FREE Engineered Pilot Run and complete production cost data.

FREE SAMPLE PROCESSING

■

GET FACTS TODAY

ALMCO DIVISION, Queen Stove Works, Inc.
Albert Lea, Minn., Dept. P-6

Please send me latest descriptive literature and address of nearest SUPERSHEEN Engineering Clinic.

NAME_____

ADDRESS_____

_____

America's Most Versatile "ONE OPERATION" Finishing Process

The Modern Office Needs

PITTSBURGH INDUSTRIAL FINISHES

to make office equipment look better... last longer

FOR more than ninety years, Pittsburgh has given valuable assistance to users of industrial paints in solving finishing problems.

● **For instance,** Pittsburgh finishes help make office equipment and appliances better-looking and longer-lasting—typewriters, sound-recording and business machines, filing cabinets, water coolers, desks, chairs, desk lamps and metal receptacles of many kinds.

● **By working with** the technical and engineering staffs of the makers of these products, Pittsburgh has produced high-grade industrial finishes to meet any number of performance standards. Among these are a wide range of Lacquers for metal and wood, an equally wide variety of Industrial Enamels, to meet almost every general finishing requirement, and a series of Lavax Wrinkle Finishes for wood, paper, steel, metal castings, aluminum, plastics, etc.

● **These coatings** provide exceptional adhesion, toughness and durability. Because they are easy to apply and dry quickly, they speed production. These fine finishes add to eye appeal and also keep office equipment looking better for a longer period.

● **This broad experience** in providing tailor-made coatings of all needs to meet hard and fast performance standards can be helpful to you. Call on us for facts and figures.

PITTSBURGH PLATE GLASS COMPANY
Industrial Paint Division, Pittsburgh, Pa.
Factories: Milwaukee, Wis.; Newark, N. J.; Springdale, Pa.; Houston, Texas; Los Angeles, Calif.; Portland, Ore. Ditzler Color Division, Detroit, Mich. The Thresher Paint & Varnish Co., Dayton, Ohio. Forbes Finishes Division, Cleveland, Ohio. M. B. Suydam Division, Pittsburgh, Pa.

PPG **PITTSBURGH** *Industrial* **FINISHES**

PAINTS • GLASS • CHEMICALS • BRUSHES • PLASTICS

PITTSBURGH PLATE GLASS COMPANY

A GOLD MINE OF INFORMATION on *Electric* HEATING

The New CHROMALOX CATALOG 50

If you use HEAT in any form in your plant—for processes or on production lines—it will more than pay you to send for this catalog. It's packed with specifications for many types of CHROMALOX electric heaters for liquids, solids, air and other gases; also shows the new CHROMALOX all-metal Radiant Heater and a complete line of electric unit heaters. Catalog 50 includes valuable application and calculation data.

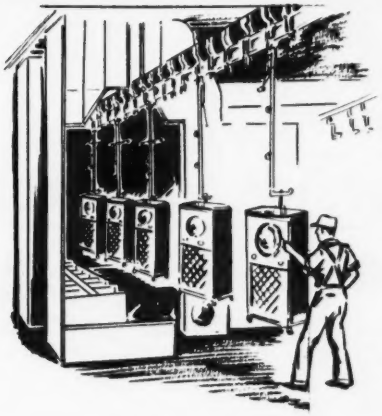
Write Today for YOUR Copy!

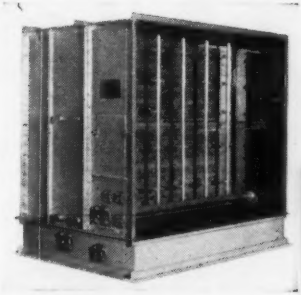
EDWIN L. WIEGAND CO. 7552 THOMAS BOULEVARD PITTSBURGH 8, PA.

CHROMALOX IB-98-B

ELECTRIC HEAT FOR MODERN INDUSTRY

Down Go Finishing Rejects When You Control DUST!

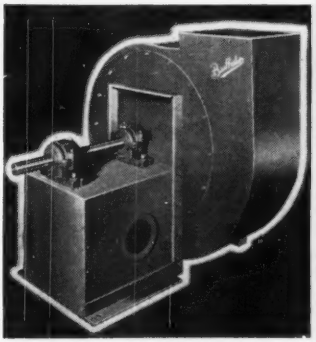




"BUFFALO" AIR WASHERS keep your air clean continuously with very little attention. WRITE FOR BULLETIN 3142-D.

The Easy, Thorough Way Is with "Buffalo" Units

You can devote a good many man-hours to keeping airborne dust off freshly coated work. But doesn't it make more sense to let a "Buffalo" Air Washer or Exhauster do the "housekeeping" for you—continuously, thoroughly and without bother? Initial cost of "Buffalo" Units is offset many times through long years of service. *Many "Buffalo" Air Washers are still removing dust efficiently after more than forty years on the job!* WRITE NOW for all facts on this easier, more thorough—and cheaper—way to cut rejects caused by dust.



"BUFFALO" INDUSTRIAL EXHAUSTERS draw off dust, fumes, grit at very low cost. Also minimize fire hazard in paint spray booth. WRITE FOR BULLETIN 3576.

First For Fans

BUFFALO FORGE COMPANY

536 BROADWAY BUFFALO, NEW YORK

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

Branch Offices in All Principal Cities

VENTILATING AIR WASHING AIR TEMPERING INDUCED DRAFT EXHAUSTING
FORCED DRAFT COOLING HEATING PRESSURE BLOWING

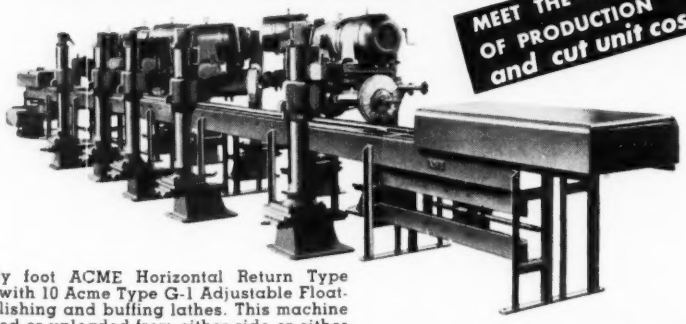
FOR HIGH PRODUCTION POLISHING and BUFFING

ACME Automatic

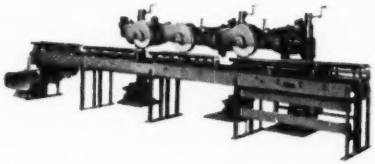
POLISHING and BUFFING MACHINES

ACME STRAIGHTLINES

MEET THE DEMANDS OF PRODUCTION and cut unit cost



Above: Forty foot ACME Horizontal Return Type Straightline with 10 Acme Type G-1 Adjustable Floating Head polishing and buffing lathes. This machine may be loaded or unloaded from either side or either end. Polishing and buffing heads may be used on either or both sides, varying in number according to the requirements of the work.



Right: Twenty foot ACME Horizontal Return Type Straightline with 3 Acme Type G-3 adjustable floating head polishing and buffing lathes set on one side of the machine. This unit can be increased in length up to 80 feet by adding standard 10 foot sections to accommodate additional buffing heads.

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SPECIAL MACHINERY AUTOMATIC BUFFING MACHINES

ACME Manufacturing Co.

1645 HOWARD ST. DETROIT 16, MICH.

Builders

editorial

Vol. 14, No. 11

AUGUST, 1950

"Build A Better Mousetrap"

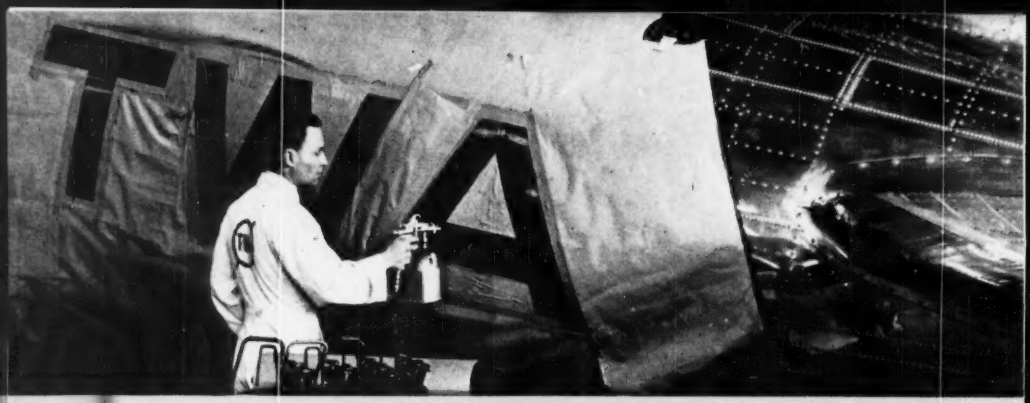
Much of our industrial progress can be attributed to a general acceptance of that wise counsel, "Build a better mousetrap—and the world will beat a path to your door." A recent trip which included tours of inspection through a number of manufacturing plants in the Eastern Great Lakes Region revealed several methods used successfully in applying this idea to manufacturing and finishing operations.

Business, of course, is at a high level of activity with many plants limited in production only by the shortage of workers and some of the more critical materials. Companies are spending substantial amounts for plant expansion, and many are operating round the clock. However, even under such favorable conditions, the companies who strive to "build a better mousetrap" stand out clearly, because they are more successful than their competitors.

The application of this philosophy takes many forms. In one plant, the "better mousetrap" takes the form of a most efficient materials handling system; in another it takes the form of special attention to product design from the standpoint of efficient fabrication, assembly and finishing. One plant recently modernized its finishing system by installing special paint handling equipment and an electrostatic paint spray booth, as well as a completely conveyorized cleaning, painting, and baking operation, achieving remarkable paint savings as well as greatly increased productivity. Several companies are redesigning the packages in which their products are marketed from the standpoint of increased attractiveness and easier product identification. In all cases, of course, the product in question must be well designed to perform its function, and must work satisfactorily.

Although some of the incentive to succeed has been removed from our economic system, it is significant, and reassuring, to note that the individual or organization that continually strives to "Build a Better Mousetrap", either in the form of a better product design, a more efficient manufacturing process, or an improved sales effort, is correspondingly rewarded.

Ezra A. Blount



MODERN MASKING FOR FABRICATION

PART I

Pressure-Sensitive Tapes, Die-Cut Stencils, Papers—Development and Characteristics

By ARTHUR P. SCHULZE

A Special Survey-Report

In the development of product-finishing as we know it today, perhaps no single piece of equipment in America's factories and mills, plants and shops has contributed more importantly to the attainment and maintenance of continuously high production levels, uniformly dependable product quality, and consistently low unit costs than the spray gun. Significant as its contributions are to those hallmarks of modern finishing, however, the spray method frequently poses a problem—one which springs simply from the fact that the gun sprays paint, or a small amount of it, over areas where it is not wanted.

Application speed and convenience, finishing material economy, and coverage uniformity are all readily secured with a spray gun adjusted properly and used correctly by skilled operators. But where protection from paint overspray or spray dust proves necessary or desirable—and there are many such instances—masking of such areas by some suitable means is required.

This, in turn, inevitably resolves itself into two basic questions: (1) how to do the masking operation most effectively and economically; and (2)

Pressure-sensitive tape, paper, die-cut stencils, form-fitting metal masks, liquid masking materials, peelable plastic coatings, and allied products—all have their proper place in facilitating finishing and fabrication of a wide array of products in many different industries. Each product or process, serving a useful function as it contributes to faster production, better product quality, lower unit costs, is reviewed in this searching survey of modern industry's utilization of masking materials and methods. Of timely interest to all finishing engineers, department superintendents and shop foremen, the following discussion is the first of four articles devoted to this important subject.

MATERIALS AND METHODS AND SPRAY FINISHING

what material or method to use. These and related considerations confront virtually every painting department or finishing shop at one time or another.[1]

Because of this, together with the fact that most industrial protective and decorative coatings manufactured today (over 85 per cent) are spray applied,[2] masking has become a vital step in the protective painting or decorative finishing of items covering an amazingly wide range. They vary in scope and size from baby buggies to airplanes, radios to railway equipment, trucks to toy, cars to cabinets, home appliances and housewares to office machines; and their number continues to grow steadily.

Masking now encompasses a host of other important applications, too. Little wonder, then, that it ranks as an essential adjunct to numerous diverse fabricating operations **before** and **after** finishing work. Its use even extends to protective packaging of prod-

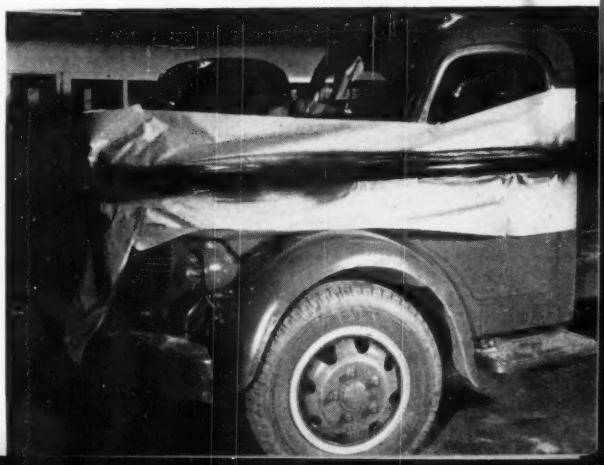


Fig. 1—Spraying decorative band in contrasting color on truck cab, hood, and cowl. Masking paper, with paint edges "locked" firmly in position by pressure-sensitive tape possessing a "good grab," protects surrounding areas against paint overspray or spray dust. (*Photo courtesy Minnesota Mining & Mfg. Co., St. Paul, Minn.*)

ucts in shipment and storage as well as to maintenance of spray booths.

Many and varied are the "tools" employed by modern industry to handle its assorted masking problems. For

Fig. 2—"Scotch" Brand Masking Tape is used here to cover areas that will serve as final trim on this table-type cabinet for a combination phonograph-radio.
(Photo courtesy Minnesota Mining & Mfg. Co., St. Paul, Minn.)

example, some plants find that pressure-sensitive tapes provide an efficient, low-cost answer to bordering and striping problems; while other shops use tape and paper in combination for separating parts of work on many small jobs in addition to those which may be either too simple or too complicated to handle most readily by other methods.

Again, for lettering, or for the application of insignias, trademarks, patterns, designs or allied decorations, ready-cut (die-cut) paper masks, stencils, or special adhesive papers are frequently used. On the other hand, where it is desired to produce a more or less intricately shaped multi-color design repetitively and in large volume, then a form-fitting fabricated or electroformed metal mask or shield may be considered as offering the best solution from the application time, result, and cost standpoints. Add to these methods such other materials as liquid masking compounds and peelable plastic coatings—and you have a bird's-eye view of the range of techniques at the individual finisher's command for handling any one of a number of different masking jobs with which he may be confronted.

It may be said, therefore, that these various means of masking have their proper place in product finishing and fabrication; and each, used correctly and on the type of work for which it is most suitable, can be confidently counted upon by the user to aid him in turning out a quality finishing job economically.

Of course, the choice of a particular masking method for finishing in any given instance depends upon several factors. Among these, for example, are: type, size, shape, and quantity of product to be finished; in some cases, its selling price; kind of protective or decorative coating to be applied; the particular decorative design or effect desired, whether it is a simple two-tone striping job or an elaborate multi-color application; production rate, and so on. In other words, each job is an individual one, generally speaking. Use of masking in connection with operations other than finishing involves different considerations and techniques.

In view of this wide latitude of production variables and shop conditions, it is exceedingly difficult in many cases to set down hard and fast rules regarding the application of masking techniques and materials to all plant masking requirements. As previously indicated, each product has its own advantages for particular product applications, with some materials prov-

ing more suitable than others on certain classes of work and vice versa. Yet, from actual production experience, it is possible to draw some ideas and suggestions which will prove of timely interest and constructive value to engineers, plant supervisors and shop foremen seeking successful ways to solve masking problems both old and new better, faster, easier, or cheaper. So our prime purpose here, then, in surveying the principal kinds of masking materials in everyday use, is three-fold: (1) to point out the outstanding features of each method, thereby emphasizing its major advantages; (2) to examine its application techniques; and (3) to review its most typical and important applications.

Pressure-sensitive tape—so-called because it sticks firmly to dry surfaces merely with a touch, without having to be moistened—is nothing new. Cloth-backed surgical tapes of this type, for example, have been available for many years. But the first pressure-sensitive paper masking tape—a tape designed explicitly to meet spray painting problems—is comparatively new, dating back only to 1925, when the "granddaddy" of today's "Scotch" brand pressure-sensitive tapes was born.

That first tape, created by Minnesota Mining and Manufacturing Co., was born as a result of spray painting problems in auto repaint shops, as seen by a man who was testing new types of sandpaper for auto refinishing. The man was Richard Gurley Drew, then a 3M company laboratory assistant, now director of the firm's Products Fabrication Department.

Drew optimistically promised a repaint shop that he could concoct a tape that would solve masking problems—a tape that would stick promptly without moistening, that would

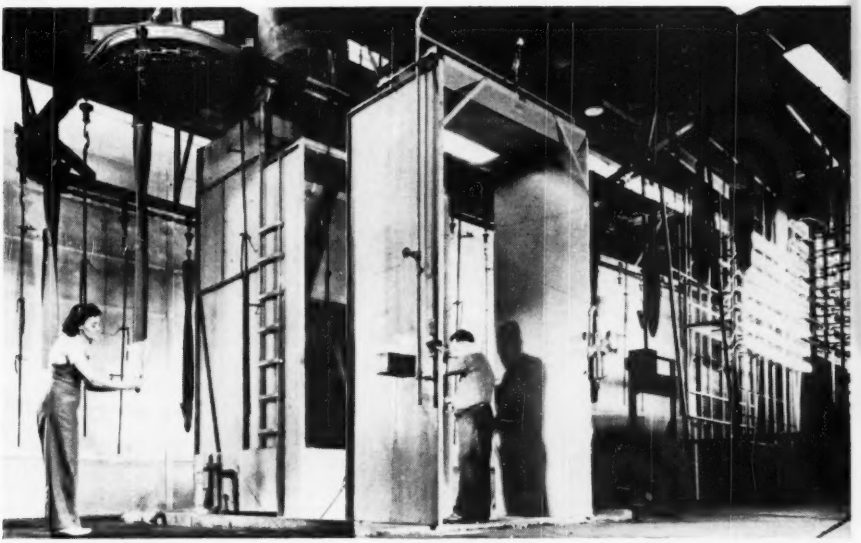


Fig. 3—Fitting paper mask over that portion of propeller blade tip which is not to be sprayed, before it enters spray booth. After spraying operation, the blades, still on the overhead conveyor, are carried through infra-red lamp banks shown in the background.
(Photo courtesy Curtis-Wright Corp., Propeller Div., Indianapolis, Ind.)

seal against solvent, and that would stick tightly yet remove easily without lifting the paint and without leaving an unsightly residue.

The first tape produced for the job—it had adhesive on the edges but not in the center—was a far cry, indeed, from the superior pressure-sensitive tapes devised since; but it was then a brand new thing with many advantages, and was warmly welcomed. Later, when the 3M company came out with a better masking tape, with a rubber-based adhesive, the welcome became almost an ovation.

Correspondence between another leading masking tape producer and the author also throws equally interesting sidelights on the historical background from which have sprung the vast and diverse masking operations conducted by industry today. With the advent of the two-tone automobile some two decades ago, The Seamless Rubber Company, New Haven, Conn., noted with challenging curiosity that one of their Detroit distributors for surgical plaster (Seamless adhesive tape) sold in one month a volume of this product far exceeding the quantity normally necessary for use in the Motor City's hospitals and clinics covering a six-month period.

Delving deeper into this apparent sales phenomenon, the company soon learned that a painting foreman in one of the larger automobile factories had conceived the idea of using surgical plaster to mask cars for spray painting. That discovery spurred Seamless Rubber to make its first 60-yard industrial tape roll, composed of a cloth backing and intended primarily for paint masking. Medications were eliminated from the mass of the adhesive plaster; a special adhesive compound was developed for this purpose.

In manufacturing this product in the Seamless Rubber plant in New Haven, a mill foreman designated the master rolls with the code "F. O. S.," meaning "friction one side." This was the first "F. O. S." Industrial Masking Tape manufactured.

It was not long after Seamless Rubber started making "F. O. S." that, as indicated earlier, Minnesota Mining & Mfg. Co. conceived of a paper construction for masking tape that would supplement their abrasive business with

Fig. 4—In both automobile manufacturing plants and automotive refinishing shops, masking tape and masking paper form a combination frequently used to protect windows, headlights, chrome plated and other metal work during spray painting. For this application highly heat-resistant creped-back tape capable of withstanding oven baking up to 300 deg. F. is used.
(Photo courtesy Minnesota Mining & Mfg. Co., St. Paul, Minn.)

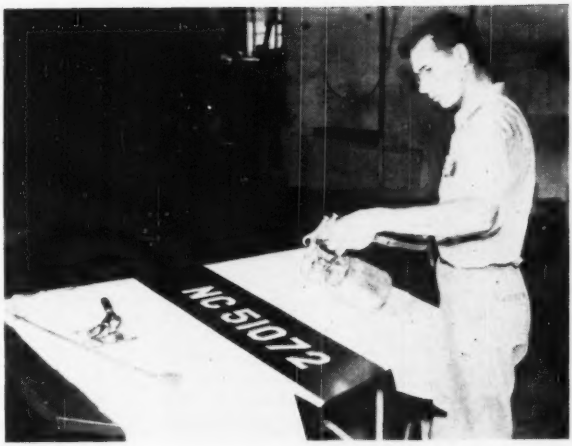


Fig. 5 — Spraying numerals on airplane rudder with cup spray gun. Tape holds cardboard stencil securely in place.
(Photo courtesy The Franklin Airport, Toledo, Ohio)

the automotive industry in Detroit. The first developments of paper tape were extremely crude. Adhesive transfer, moisture absorption and other deleterious effects indicated that the paper masking tape would have an extremely short life. Progress was not to be denied, however, and a suitable creped-back product capable of taking curves was subsequently developed. The thinness of the paper tape made possible less paint build-up at the edge. Moreover, it afforded better definition of two-tone masking. Improvements continued, and a non-hygroscopic, comprehensive paper masking tape resulted.

The masking tapes developed since these early 3M and Seamless products, together with masking paper, probably comprise the most widely used means of protecting or shielding adjoining areas during modern production spray painting operations.[1] This tape—"masking tape" as it is more familiarly known to many users—is obtainable in a variety of standard widths—¼, ⅜, ½, ⅝, ¾, ⅞, 1¼, 1½, 2, 3 and 4 inches. Various manufacturers, such as Industial Tape Corporation, Minnesota Mining & Manufacturing Co., Mystik Adhesive Products, Bauer & Black Division of The Kendall Company, and The Seamless Rubber Company package this type tape in 60-yard rolls, and ship them in bulk cases of 144 rolls. For smaller users, tape is packed in cartons containing 12 rolls each.[4]

For ordinary masking applications, pressure-sensitive tapes of two types are available. One is called "creped," the other "flatback." Unusual flexibility is a distinguishing characteristic of creped-back tape; with it, curves and uneven contours may be followed quite easily. Tape of this type, according to one manufacturer's specifications, is about 9 mils thick; tensile strength, 18 lbs. per in. of width; average adhesion to work, 30 oz. per in., and stretch at break, 10 per cent.[4]

Compared to creped tape, the flatback type is thinner and less flexible.[4] It is designed principally for straight-line applications in spray painting, where a sharp, clear line is desired[4] and for cutting stencils.[5] The standard non-hygroscopic or waterproof tape is used for all general masking purposes, where no after-baking of the tape is involved and where the surface to be taped is reasonably smooth. Baking of ordinary tape may result in its adhesive becoming tacky and sticky, causing surface smears and smudges which must be removed with naptha.[1]

This annoyance and trouble can be avoided easily, however, by using thin, strong, flexible tape with an ad-

hesive specially developed to withstand the elevated temperatures of oven-baking. Capable of lengthy exposure to temperatures as high as 300 deg. F., without causing transfer upon removal,[5] such high-temperature

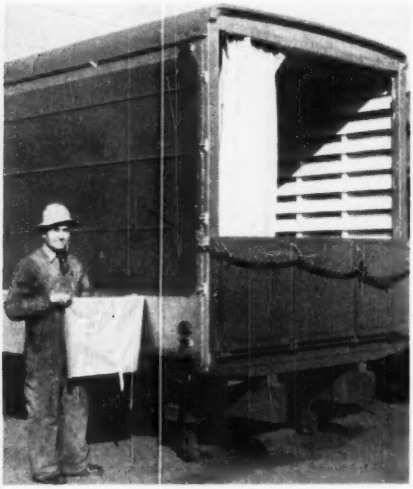


Fig. 6—Removing masking paper and tape from truck-trailer after painting. Note clear, sharp line of finish.
(Photo courtesy Minnesota Mining & Mfg. Co., St. Paul, Minn.)

tapes make it practical to mask metal parts, spray them with finishing material, dry the work in either convection or infra-red ovens, then remove the tape after finishing. Tape of this type likewise can be employed advantageously to protect bright chrome plated finishes during baking operations in repair painting or refinishing of automotive equipment and other products.[4] Special creped "white-work" non-staining paper tape is also available for masking operations on white or near-white (pastel) lacquered or enameled surfaces.[5] This type is used as well for temporary binding of home appliances during transit.[6]

Both creped and flatback types are made in varied thicknesses and strengths to meet the different requirements imposed by particular classes of work. For instance, in addition to the white-work tape previously mentioned, a low-tack tape with an adhesion of only 5 oz. per inch is especially suitable for temporary or short-time protection of metal surfaces,[4] or in those applications where easy removal of tape from the surface is desirable, as for example, a lightweight object on which the finish is still wet.[1] For the difficult jobs on the other hand—rough surfaces, wood and porous castings—an extra-adhesive tape with an adhesion of 40 oz. per inch is available.[1, 4]

Although this summation of paper masking tapes is far from complete, it does provide an adequate indication of the different types of tape most generally used for finishing and allied operations. Suffice it to say, paper tapes vary in thicknesses, strength, finish maneuverability, aging qualities, tackiness, and so on. Many have been designed for specific uses and should not be used indiscriminately.[7]

Though generally masking tape manufacturers produce tape in a variety of constructions—each for the particular intended application—one company (Seamless Rubber) has developed a creped-back paper masking tape, designated as SR 660 "F. O. S.," which is a general-purpose product. It is thin, non-hygroscopic, and will not stain or discolor white or pastel shades of lacquers or enamels; also, it withstands moderate temperatures without transfer of adhesive upon removal. And because this tape will unwind without undue tension from the roll itself, it can be applied with a minimum of distortion.

In masking with pressure-sensitive tape, the chief objectives are neat and thorough protection of the surface, and easiest possible removal of the tape after the finishing job is done.

Particular attention to cleaning and surface preparation, especially around the area where paint and tape are to meet, will be amply rewarded both in more secure clinging of tape to the surface and its pulling off with a clean edge later when the paint has set. Finger marks along areas to be taped should be avoided for these reasons.[1]

Positioning of parts at comfortable height and adequate illumination of all working areas are added factors conducive to good tape-masking, particularly of small work. The finisher must also have the tools and accessories that masking demands—an ample supply of masking tapes and paper in assorted widths, and such items as safety razor blades, scissors, a straight edge, a flexible plastic rule, tweezers, and a suitable sharp pick. A woodcarving knife with interchangeable blades, such as that sold in many hobby shops, also proves a mighty handy tool.[1]

In using pressure-sensitive tape for masking, as with any other production or maintenance tool, best results are obtained, work expedited and costs minimized when certain simple yet essential practices are observed. In pulling tape from the roll, never stretch or pull it. Just lay it down easily as it comes off the roll, pulling it straight and slowly, taking particular care not to twist it or to permit the adhesive sides to become stuck together.[1]

Tape laid in this manner will never pull back during the painting operation. If the crepe backing on the tape has not been unduly stretched, it can expand and contract without pulling away when the solvents strike it. This method eliminates time lost in rework since the tape always stays in place.[3]

To avoid unwinding more tape than necessary for immediate use, some maskers cut off a piece of tape of sufficient length as required, then lay the roll aside. The majority of skilled operators, however, work directly from the roll of tape, unwinding it with a continuous, steady pull until the desired length is secured.[4] In any event, unwinding of tape in a hurried, jerking motion or fashion should be avoided because this is apt to result in kinks and "build-up" at spots where such quick pulls or jerks were made.[4]

Preferred tape-masking application practice calls for working a few inches at a time, lightly "tacking" it with the fingers so that should the tape not follow the line accurately, it can be lifted easily, repositioned properly,

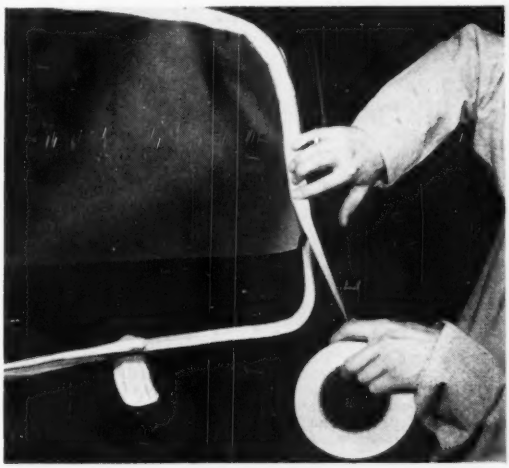


Fig. 7—Masking a car windshield prior to painting, a skilled automobile painter may permit the tape to gap a little on the window side, but will have a tight straight line along the metal side, where a sharp edge is required for spray painting. Tape must have "dead stretch" to conform to curves without "creeping," must be flexible to be easy to handle, and must have tight adhesion to metal to withstand blast of spray gun. Second step is to apply masking paper over the window. (*Photo courtesy Minnesota Mining & Mfg. Co., St. Paul, Minn.*)

then pressed firmly into place. This method also may be used on any area where part of the surface is covered with masking paper.[1]

Skillful taping technique is reflected at its blue-ribbon best in decorative color-separation painting, for when masking is marked by artistry and craftsmanship, resultant sharply defined application of sprayed colors or plating substantially steps up saleability and "buy-appeal" of even the most utilitarian product. Designs produced with the aid of masking tape range from highlighting crinkle or wrinkle finishes with stripes of a high-luster smooth enamel, as used on some typewriters and vacuum cleaners, to elaborate chromium-plated designs on supermarket cash registers.[1, 9, 11, 12, 13]

Fig. 8—Tape saves time on the production line. One of the many, varied uses for industrial pressure-sensitive tape along the automotive production line is shown in this picture. *(Photo courtesy GMC Truck & Coach Div., Pontiac, Mich., and Bauer & Black Division of The Kendall Co., Chicago, Ill.)*

Virtually all these applications require a visual pattern or guide of some sort to follow. Perhaps it is formed with pencil lines or dots between which tape is laid; or, gages may be used. Again, the design may be embossed in the case. In most of these uses, tape is removed before the finish is baked or cured; hence, easy and quick removal is a cardinal consideration from the application viewpoint. Conrad[1] offers the following suggestions based on accumulated shop experience and production practice which, if observed, not only will assure fast, simple removal of tape, but also prevent bridging or creeping, even on highly polished chromium-plated work.

"Leave a small tab of tape loose or unsealed as you begin to mask each separate area. Serving as a starter or grip when the time comes to remove the tape, this tab may be allowed to extend over an edge, provided, of course, that it presents no interference with spraying. Doubling a tab of smaller tape and inserting it at a convenient seam affords an alternate means of accomplishing the same objective.

"Wherever possible, tape each area progressively and continuously—that is, make certain that each length or width of tape lifts the edge of the following piece as it is removed. One strip of tape should not cross another in a manner, however, that may impede the removal of either.

"It is well to remember that small tape comes off easier than large tape; in fact, the smaller the tape, the easier its removal. This factor is of particular importance on small, light objects on which no firm grip can be secured as the tape is being pulled free.

"In rounding curves or crossing de-

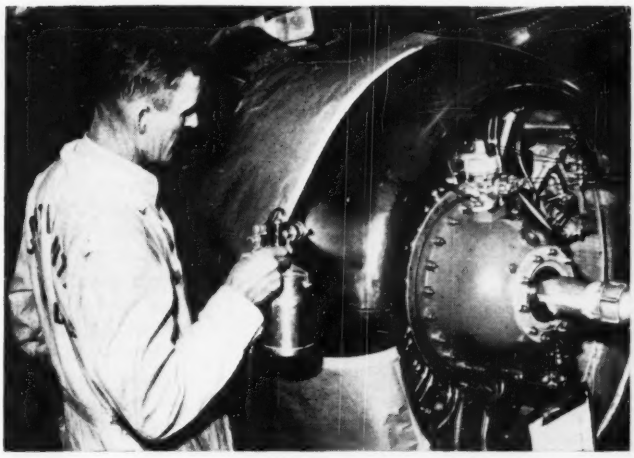


Fig. 9—Spray painting engine cowl on a 21-passenger Douglas Airliner in repair shop of Continental Air Lines. DeVilbiss MBC Gun and Type KR suction feed cup are being used. Note how masking paper and tape protect adjacent areas. *(Photo courtesy Continental Air Lines, Inc., Denver, Colo.)*

pressed areas particularly, allow the tape to lie naturally — without stress or strain. In other words, lay it on carefully, watching the boundary edge only and letting it attach itself to the surface until it is perfect. Then press tape down firmly in place.

Now that the tape has been properly applied, we are ready for the finishing operation. When spraying a masked surface, it is good practice to hold the spray at a slight angle to direct the spray away from the masking tape, instead of spraying at right angles to the tape. When this precaution is taken, any tendency of the spray to be driven under the important edge of the tape is avoided.[9]

Tape removal is the next and final step. To get the masking tape off without accident often proves quite a neat feat in itself. In fact, it has not been uncommon to find many excellent painting jobs ruined at this stage of the game simply by a length of tape falling across a freshly painted section, by smearing the protected areas or parts with finishing material, or even by pulling the entire piece off the worktable.[1] So it is imperative to know when and how to remove masking tape if "lifting" or "tearing" of the paint film is to be avoided, and it's a technique which can be learned best only from actual experience.[9]

Paint must be allowed enough time to "set up" sufficiently to permit touching or light rubbing with the fingers before masking tape can be safely removed. In one automotive refinishing shop, for example, every lacquer job is allowed to dry at least 40 to 45 minutes and enameled work overnight before starting to strip off masking tape.[9]

To remove tape, the experienced masker starts at one end and pulls it away gently, steadily—without violent jerking—pulling it straight away from the finished surface. In other words, he pulls the tape at right angles to the surface, or squarely, so as to leave a clean, sharp edge.[9] Sometimes, however, when stripping tape from baked or lacquered finishes, separation is ragged with a right-angle pull, but the tape will come off clean when the pull is made straight back. When this fails, some shops use a straightedge and flexible rule, lightly tracing the masking edge with a safety-razor blade.[1]

Wisest and safest approach to the problem of stripping tape from baked

or lacquered finishes, it seems, is to proceed slowly until it appears quite certain that tape will come off clean. Removal of masking tape from lacquered work frequently can be simplified and speeded up by spraying a mist coat of high-quality thinner around the

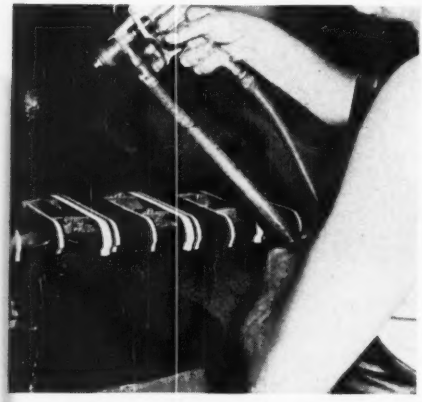


Fig. 10—In one prominent typewriter manufacturing plant, stripes are quickly, easily, and economically applied to typewriter casings by the spray gun with the help of Permacel masking tapes.
(Photo courtesy Industrial Tape Corp., New Brunswick, N. J.)

taped section or area, then permitting the lacquer to soften for a few seconds before stripping the tape.[1]

Removal of tape from the finish while it is still wet or still in fairly soft condition is usually handled somewhat differently. First requisite, of course, is to make sure that the masked piece itself as well as the workbench or table remain stationary, free from moving. Starting tab should be grasped with blunt tweezers or long-nose pliers to get the tape started. After an inch or two has been lifted, it is folded back upon itself, so that clean adhesive may be grasped by thumb and forefinger. Tape should be pulled back very slowly to avoid tearing.

Where tape being removed becomes too long to handle conveniently, it should be cut off close to the work. Then the operator can get a fresh grip on remaining tape and continue pulling it off. Should his grip become insecure or fatiguing, then he should take "time-out" briefly to renew it before proceeding. This practice can save many headaches.

Precaution must be taken, also, to avoid smearing fingers with paint from the tape because such smudges or smears, in turn, may be transferred onto painted work. However, when it does occur, smearing can be removed by deftly applying to the surface a cotton swab or cloth moistened with a safe solvent. Never try to use a brush for this purpose, as the risk of excess solvent running from the brush onto the finished area and thereby spoiling it is too great.[1]

Proper storage of tape is every bit as important as its correct handling and use from the standpoints of ease of application and satisfactory results. Here are a few common-sense rules[1,4,5] which, if followed, will go a long way toward giving you "maximum mileage"—100 cents worth of masking value in return for every dollar spent on pressure-sensitive tape:

1. Don't keep tape in storage for prolonged periods. Use oldest tape first. Even though adhesive life has been authoritatively estimated to be six months or slightly longer, fresh tape always works better, experience shows conclusively.

2. Keep storage room cool, dry, well-ventilated. Average temperature should be about 72 to 75 deg. F., and relative humidity about 35 to 50 per cent the year round.

3. Store tape in original shipping containers. Do not stack tape in loose rolls on shelves.

4. Do not expose tape to sunlight during storage; prolonged exposure hastens adhesive deterioration.

In setting up specifications to govern the purchase of pressure-sensitive paper masking tapes, it is important

to remember that their successful and satisfactory use in spray painting operations hinges directly upon the complete fulfillment of a number of exacting requirements. They must:[10]

1. Adhere instantly and tightly to any wood or metal surface, or painted surface, to which they are applied.

2. Conform readily to curves, and to concave, convex or irregular surfaces.

3. Insure clean, sharp separation between adjacent colors.

4. Be impervious to the solvents in paints and lacquers.

5. In some cases, successfully withstand the elevated temperatures of baking ovens. For example: aircraft engines, telephone parts, other metal parts and products where a permanent baked finish is essential.

6. Strip off easily upon completion of the spraying operation, leaving no residue on the surfaces to which they have been applied.

Because they meet all these stringent requirements, pressure-sensitive masking tapes of leading manufacturers have literally become "production tools" indispensable to quality finishing in hundreds of plants and shops. Spray guns put the paint on; masking tape keeps the material off areas where it is not wanted—and a better job is done with less paint. That's the simple yet effective "formula" for the controlled application of paints, varnishes, enamels, lacquers, and protective coatings to a widely varied range of manufactured products and parts. Color separation, striping, spraying of lettering and insignia, baking of enamels, spraying of protective coatings on restricted areas of machines and parts —these aptly typify the many finishing operations presently being speeded and facilitated by the use of pressure-sensitive masking tape.[10]

Fig. 11 — Removing masking tape from trackless trolley coach after painting.
(Photo courtesy Minnesota Mining & Mfg. Co., St. Paul, Minn.)

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AUTHOR'S ACKNOWLEDGMENT

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Toledo, Ohio

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St. Paul, Minn.

Mystik Adhesive Products
Chicago, Ill.

Robert Spector Co.
New York, N. Y.

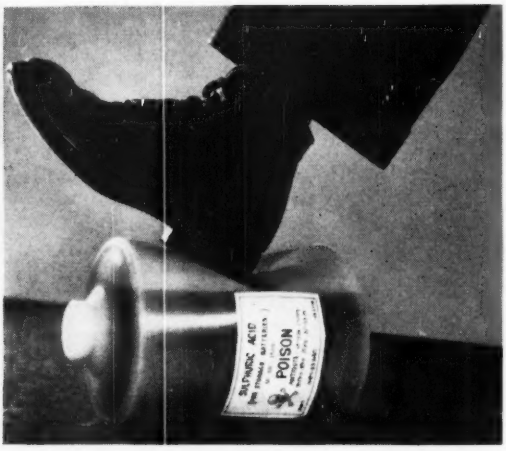
The Seamless Rubber Company
Industrial Tape Division
New Haven, Conn.

Alloys of Phosphorus with Cobalt or Nickel

A COMMERCIALY feasible method for producing electrodeposits of cobalt or nickel alloyed with as much as 15 per cent of phosphorus has been developed by Abner Brenner, Dwight E. Couch, and Eugenia K. Williams of the National Bureau of Standards.[1] The new phosphorus alloys are more easily deposited than chromium and are very hard, corrosion-resistant, and bright. They should thus be of value for many of the applications in which chromium plate is now used to obtain a hard, wear-resistant surface or a decorative finish.

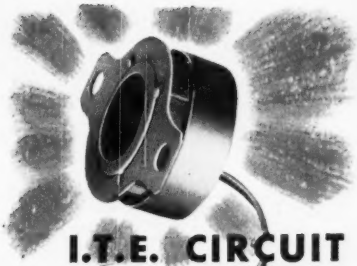
Plating baths for depositing the phosphorus alloys are rather simply prepared, consisting of common nickel or cobalt salts such as the sulfate or chloride, to which is added phosphorous acid as a source of phosphorus in the deposit. The baths are operated at

[1] For further details, see Electrodeposition of Alloys of Phosphorus and Cobalt or Nickel, by Abner Brenner, Dwight E. Couch, and Eugenia Kellogg Williams, J. Research NBS 44, 109, (1950) RP2061.



ACID CONTAINER WILL WITHSTAND ROUGH HANDLING—The gallon-size polyethylene container being ground under heel here was designed by Packaging Branch of Air Material Command's Materials Laboratory to eliminate the hazards involved in transporting acids in glass bottles. The container shown here was designed to hold battery electrolyte for spare aircraft batteries, but polyethylene containers and bottles of various sizes are also specified for use when transporting other acids by air.

(Photo courtesy USAF Air Material Command, Wright-Patterson Air Force Base, Dayton, Ohio)



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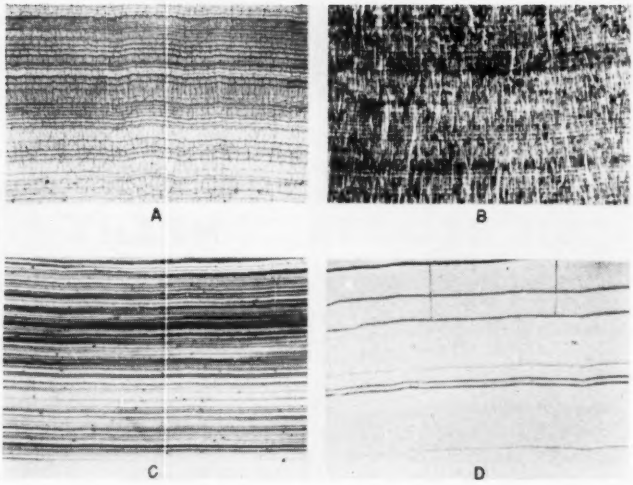

Fig. 1 — Photomicrographs of alloys of phosphorus with cobalt and nickel electrodeposited by means of a technique recently developed at the National Bureau of Standards. The low-phosphorus alloys show a columnar structure while the structure of the high-phosphorus alloys is laminated or banded. A, low-phosphorus nickel (2.3 per cent phosphorus); B, low-phosphorus cobalt (2.2 per cent phosphorus); C, high-phosphorus nickel (13 per cent phosphorus); D, high-phosphorus cobalt (10 per cent phosphorus). Magnification x 275.

a low pH—between 0.5 and 1.5 depending on the composition. To maintain the desired acidity in the cathode film, the solution must be buffered. The Bureau has found that phosphoric acid is one of the best chemicals for this purpose. The plating baths are kept at 75 deg. C. or above because at room temperature the cathode current efficiency is very low and the deposits are weak. Current densities should be between 5 and 40 amperes per square decimeter. At the usual current density—about 10 amperes per square decimeter—the rate of deposition is fairly high, amounting to a few thousandths of an inch an hour.

The appearance of the deposits depends upon their phosphorus content. Alloys with less than 2 per cent of phosphorus are usually smooth with a mat finish; but as the percentage of phosphorus increases, they become brighter, reaching a peak of brightness at a phosphorus content of about 10 per cent. When such deposits are plated on a dull surface, they increase in brightness as they become thicker. As a result of the slightly dark cast of the high-phosphorus alloys, their reflectivity is 45 to 50 per cent, as compared with about 60 per cent for buffed nickel coatings.

When some of the phosphorus alloys are immersed momentarily in a solution of an oxidizing agent, such as ferric chloride, or made anodic in the plating bath, a jet black film is formed on the surface of the metal. This film is hard and adherent and appears to have possibilities for decorative use.

Photomicrographs of the low-phosphorus alloys show a columnar structure while the high-phosphorus alloys are found to have a laminated or banded structure. X-ray diffraction patterns of the high-phosphorus alloys show no crystalline structure. When heat-treated, the deposits develop a fine-grained structure instead of the large crystals characteristic of pure nickel or cobalt.

The hardness of the deposits as plated varies from 350 to 720 on the Vickers scale, increasing with phosphorus content. When the alloys are heat-treated at 400 deg. C., they become much harder. For example, a heat-treated cobalt-phosphorus deposit containing about 10 per cent of

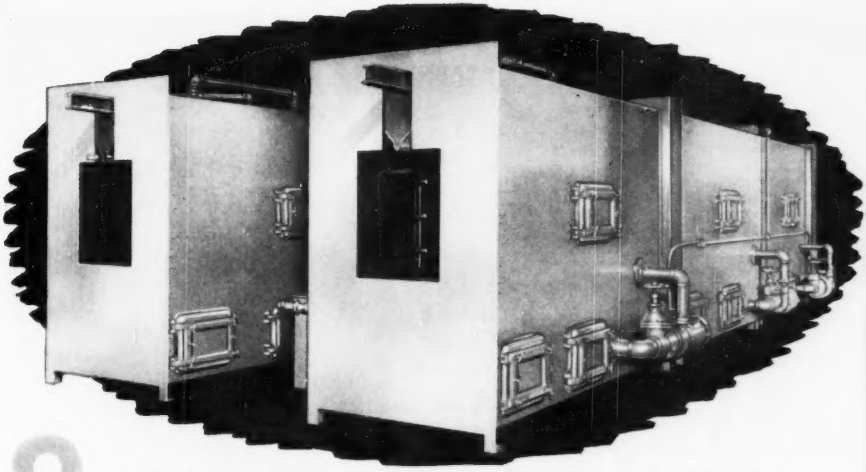

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TABLE I

Composition of typical plating bath for depositing alloys of phosphorus with cobalt or nickel

TYPE OF BATH[a]	$NiSO_4 \cdot 6H_2O$ g./l	$NiCl_2 \cdot 6H_2O$ g./l.	H_3PO_4 (100 per cent) g./l.	H_3PO_3 (100 per cent) g./l.	$CoCl_2 \cdot 6H_2O$ g./l.
Low-phosphorus nickel	175	50	50	1.3	....
High-phosphorus nickel[b]	150	45	50	40	....
Low-phosphorus cobalt	....	....	50	1.3	210
High-phosphorus cobalt[b]	....	....	50	40	180

[a] It is very important that the pH of the baths listed be less than 1.0.

[b] The pH of the high-phosphorus baths should be raised to a value between 0.5 and 1.0 by adding nickel or cobalt carbonate.

phosphorus reaches a hardness of over 1100 Vickers, which is greater than that of electrodeposited chromium. Deposits which have been heated as high at 800 deg. C. and cooled are not appreciably softer than the initial deposit. However, the alloys have poor "hot hardness" and above a temperature of 600 deg. C. are softer than unalloyed nickel or cobalt.

Although the low-phosphorus alloys become ductile after heat treatment at 800 deg. C., deposits containing more than 1 per cent of phosphorus are generally brittle. Alloys with higher percentages of phosphorus are highly resistant to corrosion and chemical attack, exceeding in this respect the pure metals. Thus, in experiments at the Bureau the nickel alloy with 10 to 14 per cent of phosphorus was attacked considerably less by hydrochloric acid than was pure nickel.

The pleasing appearance, ease of deposition, hardness, and corrosion resistance of the new alloys suggest the possibility of a number of commercial applications. Their use is indicated for gages, cylinder walls, piston rings, and other machine parts where resistance to wear is an important factor. In this connection, the more rapid rate of deposition as compared with chromium and the better throwing power of the plating bath should be of considerable advantage. Although the phosphorus alloys are not as white as bright nickel, the operation of the baths is much less critical than for proprietary bright nickel. The phosphorus alloys can be plated from a bath made up entirely of inorganic chemicals whereas bright nickel plating solutions must contain an organic brightening agent.

—*National Bureau of Standards Technical Report* 1441.

A process for creating a smooth finish on stainless steel spinning jets is described in a recent patent (S. A. Mansfield, U. S. Patent 2,496,299). The spinning jets are subjected to electrolytic anodic action in a bath consisting of:

Orthophosphoric acid ....40-50 per cent

Glycerine .....50-60 per cent

A current density of 0.1 to 2.0 amperes per square inch is employed, and the bath temperature is maintained between 40 and 125 deg. Centigrade.

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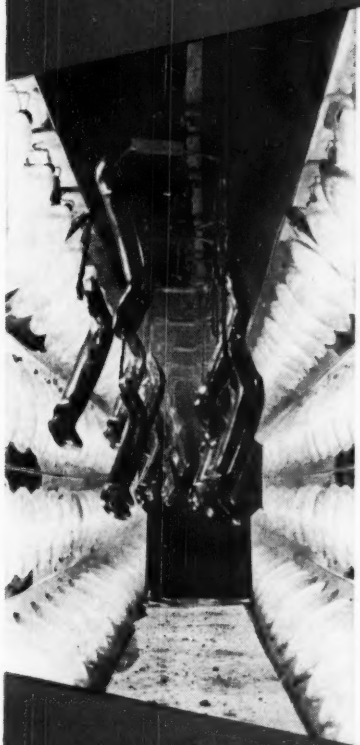

55% savings in production cost, at Automotive Stamping and Manufacturing Co. of Detroit, is typical of the advantages of a combined Infra-red degreasing and paint baking system. Here, the product moves on a conveyor through degreasing oven (3 minutes), on to paint dip tank, and then through baking oven (5 minutes). One man handles both placing and removing product on conveyor. For faster, better, lower cost production, Infra-red Evenray Systems provide astonishing utility and efficiency. Information on the experience of many plants is available for your consideration.

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Finishing Clinic

In this department are presented some of the questions submitted by readers together with suggested solutions of the problems outlined.

A British reader comments:

As one of your British readers I would like to state how interesting and informative I find your journal, PRODUCTS FINISHING.

Upon reading Mr. Mattacotti's article on "Conversion Coatings on Zinc" in the February issue, I noted several statements on the sodium dichromate process (called chromate passivation in this country), on which I would like to comment.

As you are no doubt aware, we used a great deal of chromate passivation in this country during the last war on zinc electrodeposits and on zinc base die castings. In consequence, a great deal of research work was carried out and the Ministry of Aircraft Production issued a specification to cover passivation coatings, production, control and testing of same under DTD 923. As chief chemist of one of the largest plating firms of this country, I carried out a good deal of this research work, and my diphenylcarbazide test for detection of the value of the film was standardized and included on this specification.

Quick analytical and shop tests were soon determined for estimating the dichromate, sulphuric acid, and trivalent contents of passivation solutions and were accepted as standard methods of control by all government departments and wherever passivation was carried out. These tests were carried out as early as 1942-1943 and are still used wherever passivation is carried out.

Thus, the sulfuric content can easily be estimated. There is no need for the trial and error method as mentioned in the article.

The color of the best film is dependent upon the base. On zinc base die castings, galvanizing, sherardizing and matte zinc deposits, golden-brown

with slight iridescence is best, but on a fine grained or bright zinc a green film is far superior on both corrosion and abrasion resistance. Wherever possible an iridescent film containing a preponderance of green gives the best results. The effectiveness of any film can be quickly determined by the diphenylcarbazide test.

The sulfuric acid and dichromate contents are not critical. Good results have been obtained with a sodium dichromate content of ½-2 lb./gal. (Imperial) and a sulfuric acid content of 8-64 ml./gal. It is merely a question of rate of film formation and rinsing. Where intricate and recessed work is processed, a low sulfuric acid concentration is favored (about 8-12 ml./gal.). When high speed production and simple articles are treated, the sulfuric acid may run as high as 64 ml./gal. In fact, in certain specific cases a passivation solution of ammonium dichromate and boric acid (no sulfuric) has been used. In this case the time is not critical.

Passivation formulas must be adapted to suit the plant conditions and the best times of immersion thus determined. The tendency in this country is to use the lower concentrations of sulfuric acid and add an oxidizing agent to the bath. This lowers the rate of zinc solution and makes the time of immersion less critical.

With regard to the three points giving unsatisfactory films, in this country we find there are two more important ones:

(1) Insufficient rinsing after zinc plating, thus contaminating passivation solution with zinc and killing free sulfuric acid.

(2) Accumulation of trivalent chrome and zinc in solution. This is usually denoted by a dirty brown solution, which requires scrapping. We find when the Cr^3 exceeds 1.5 g./gal. (Imperial), it is preferable to scrap the solution.

The above remarks are based on many years' experience (shop and laboratory) on passivation films, and whereas one can give pointers for best conditions, these can only be points and may have to be modified to suit individual requirements.

Frank Taylor,
Metal Finishing Consultant

———— f c ————

Question. *We are confronted with the problem of covering and protecting during fabrication and shipment* 16 *gauge No.* 4 *finish stainless steel sheets. We wonder if you could forward us information or names of companies manufacturing a protective product that we could use to solve our problem.*

L. H. K.

Answer. A strippable plastic coating which is used for the protection of finished surfaces is manufactured by the following companies (names of five companies furnished).

The use of a product of this nature for the purpose you have in mind was mentioned in the article "Finishing Operations in a King-Size Job Shop" in our October 1949 issue on Page 17 and again in our February issue in the article describing operations at the plant of Ed Friedrich, Inc., San Antonio, Texas.

In use, the liquid plastic coating is sprayed over the stainless steel, dries quickly in the air, and after fabrication and/or shipment can be peeled off the steel product, having served to protect that product from scratches and surface damage during fabrication or transit.

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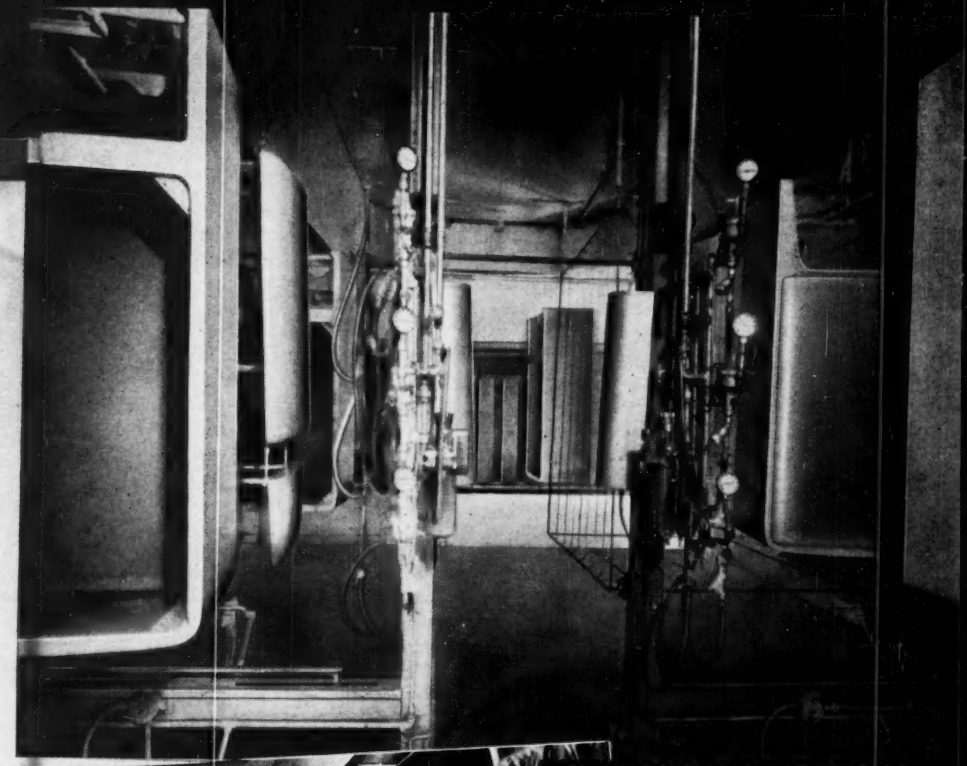
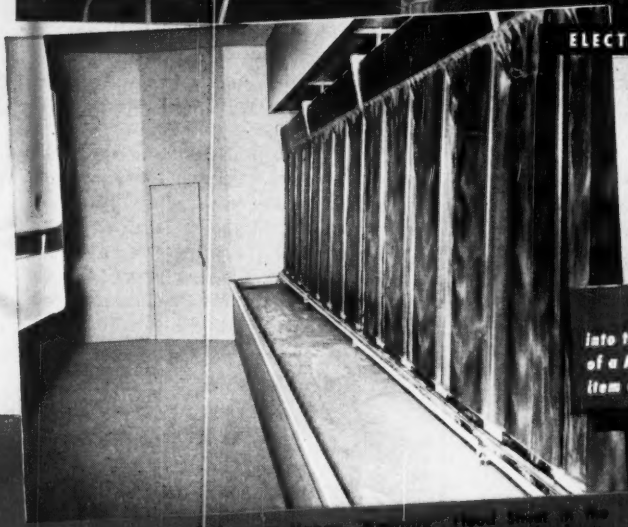


ELECTROSTATIC SPRAY SYSTEMS

Above is a new Mahon Hydro-Filter Spray Booth with the new "Hydraire" Flood Sheet (Pat. Appl. For) which was specially designed for Automatic Electrostatic Spraying of Synthetic Enamel in the plant of a large refrigerator manufacturer.



Close-up view of the new Mahon Hydraire Flood Sheet in the specially designed Electrostatic Spray Booth illustrated above.

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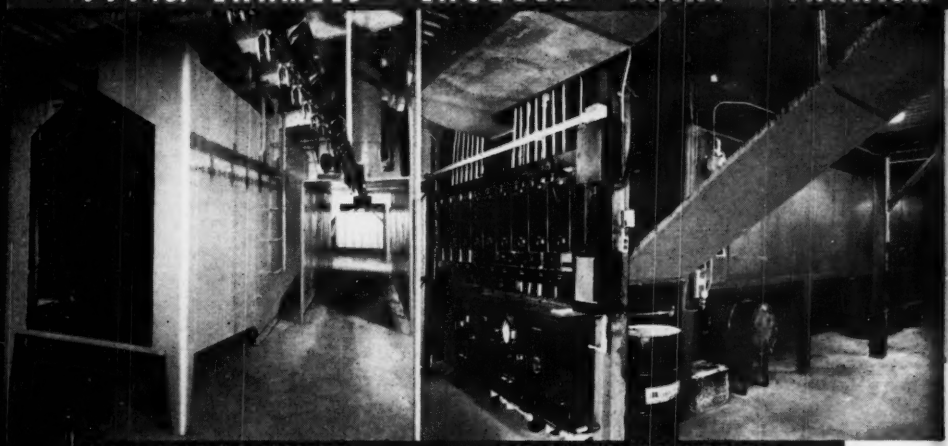

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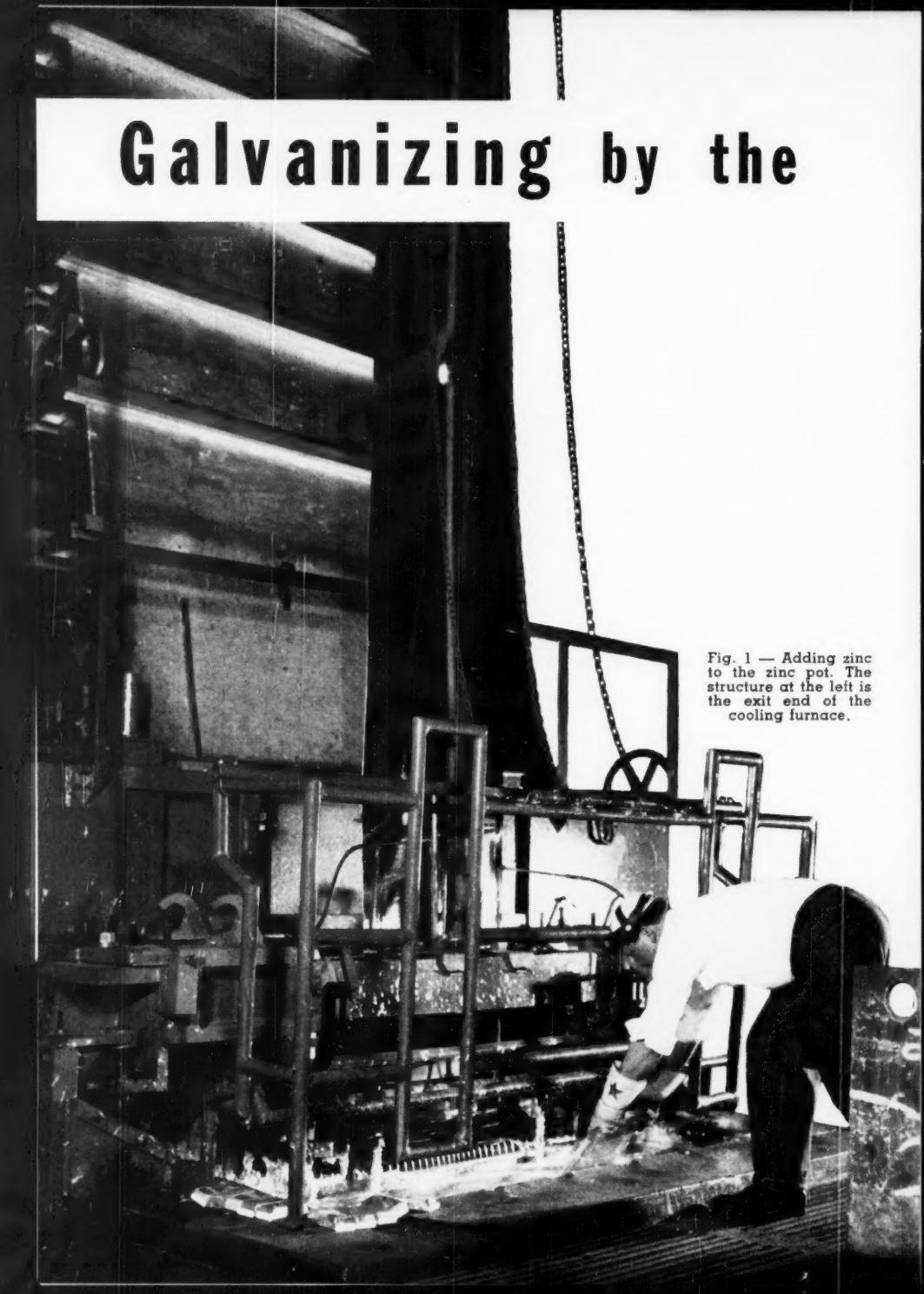


Fig. 1 — Adding zinc to the zinc pot. The structure at the left is the exit end of the cooling furnace.

Sendzimir Process

By K. OGANOWSKI

Associate Director, Research Laboratories
Armco Steel Corporation
Middletown, Ohio

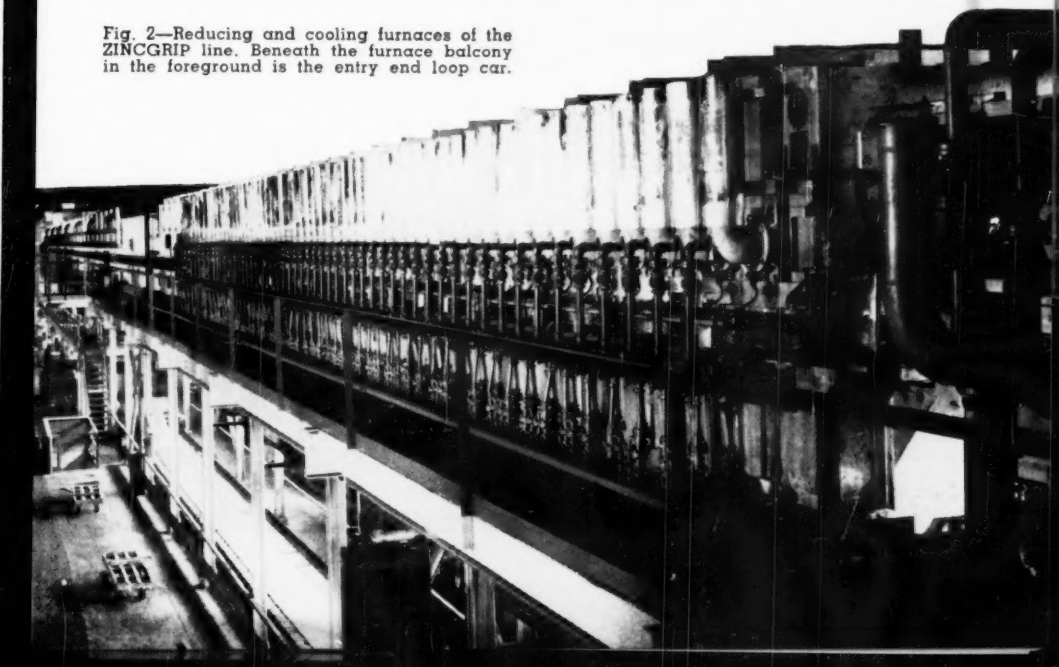
THE value of the zinc coating in combating corrosion of iron and steel surfaces was recognized early and led to the development of the ever-increasing galvanizing industry.

The methods of application of zinc to the iron and steel surfaces have changed and a gradual mechanization of the equipment has taken place. However, until 1936, the basic steps of the galvanizing procedure have remained unchanged. These consisted of cleaning of the surface of the material to be coated by pickling, fluxing the surface to promote wetting by molten zinc, and preheating the material in the molten zinc bath to a coating temperature.

With the use of cold rolled steel as a basic metal for galvanized sheets, removal of rolling lubricants by alkali cleaning and annealing of the metal before coating were added to the galvanizing process.

It has long been recognized by galvanizers that surface preparation of the base metal, temperature control during the coating operation, and composition of the spelter bath are the major factors affecting the manufacture of galvanized products. When all of these factors are simultaneously controlled at the optimum of their

Fig. 2—Reducing and cooling furnaces of the ZINCGRIP line. Beneath the furnace balcony in the foreground is the entry end loop car.



range of variation, a coated product of very high quality can be produced consistently.

Despite numerous improvements in cleaning, pickling, fluxing and heating of the zinc kettles, for many years there was no major development toward simplification of these basically complex operations, or maintaining the consistency of these operations.

In 1936 however, the first continuous zinc coating unit incorporating basic improvements and unusual new features was installed at Butler, Pennsylvania, by Armco Steel Corporation. This initial unit, based on the Sendzimir Coating Process, stimulated development in continuous zinc coating which has revolutionized much of the galvanizing industry.

Sendzimir Coating Process

The Sendzimir Coating Process* embraces a radical departure from the conventional sheet galvanizing practice. It specifies a set of conditions under which the principal requirements of the coating operation—surface preparation, temperature control, spelter composition—are readily met and constantly controlled.

*U.S. Patents 2,110,893 - 2,136,957 - 2,197,622.

Surface Preparation

Surface preparation of the base metal, which is the first of the three basic requirements of the coating operations, is accomplished in two steps: (1) oxidation of the surface, and (2) subsequent reduction of this oxidized surface. The surface can be oxidized either by heating in an oxidizing medium or by other chemical means.

When oxidation by heat is used, it is possible to remove rolling lubricants and other combustible material. At the same time there is produced a surface having the same degree of oxidation regardless of variations in the cleanli-

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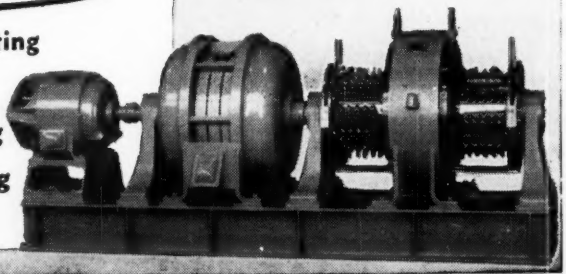

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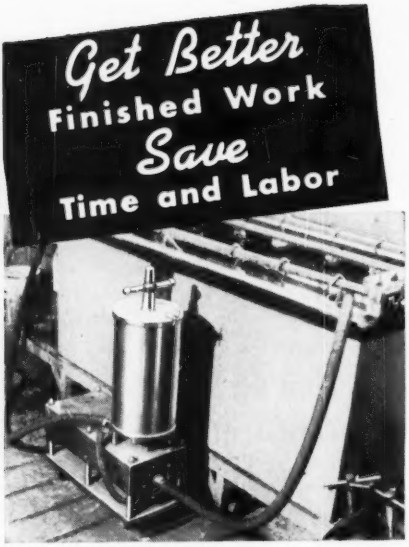

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ness of the surface of the metal upon its arrival at the coating unit. Such uniform surface preparation is possible because the products of the reaction which removes the surface contamination during the heating operation are gaseous and the degree of oxidation obtained is controlled by only one readily controllable factor—temperature.

An alternative means of oxidation employs chemical methods. An alkaline cleaner removes rolling oils and is followed by rinsing and drying to secure oxidation of the surface.

In the reduction of the oxidized surface, the reaction products are gaseous and the quality of the reducing operation is controlled by composition of the atmosphere and the temperature in the furnace. Stable operation and reproducible results are obtained consistently in the reduction operation. This is because variations in the condition of the metal surface were eliminated in the previous oxidizing step. A certain degree of desulfurization and decarburization of the surface also occurs during the reducing step.

After the two steps described, the surface of the base metal is fully prepared for the molten zinc bath.

Temperature Control

Economy dictates the combining of surface preparation steps with heat treatment of the base metal. Therefore, the full-hard, cold-reduced material, generally used in the Sendzimir coating process, is annealed at the same time the oxidized surface is being reduced. Any heating and cooling cycle, practicable for a continuous annealing operation, can be employed in this process. However, the metal when immersed in the zinc bath must be at a temperature which will allow instantaneous wetting and bonding with the zinc.

Control of the base metal temperature at the time of immersion in the bath fulfills the second requirement of

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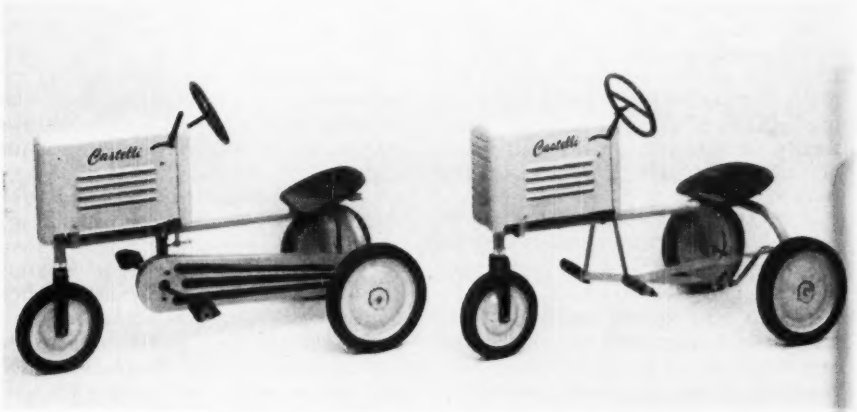

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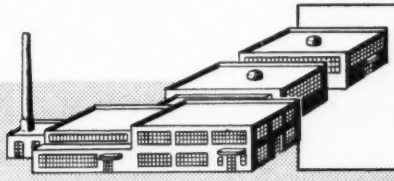

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Maintaining proper atmospheric conditions throughout the furnace for reduction of the oxidized surface and prevention of reoxidation in the cooling section, is also not difficult. Practically, it requires only maintenance of the quality and flow of a suitable reducing gas.

Bath Composition

When the metal surface has been properly prepared and the metal temperature is correct, wetting and bonding with zinc occur instantaneously and a rapid reaction between the zinc and the base metal takes place. This reaction, unless suppressed, would result in the formation of brittle iron-zinc compounds in the coating. They would occur even with the shortest practicable immersion times, and the presence of these alloys would be detrimental to the ductility of the coating.

The rate of formation of iron-zinc alloys in the coating is controlled by the addition of aluminum to the zinc bath and by the temperature of the material being coated.

Consequently, the third major requirement of the coating operation, suitable bath composition, is fulfilled and a ductile, adherent coating is obtained.

Limitations of the Process

The limitations of this process are obvious. Because of handling problems it is not readily adaptable for coating cut length sheets and formed articles. Neither is it very satisfactory for coating highly alloyed materials containing large amounts of elements, such as chromium, which have oxides that are difficult to reduce. Severely scaled steel or surfaces carrying compounds that are not combustible or volatile at

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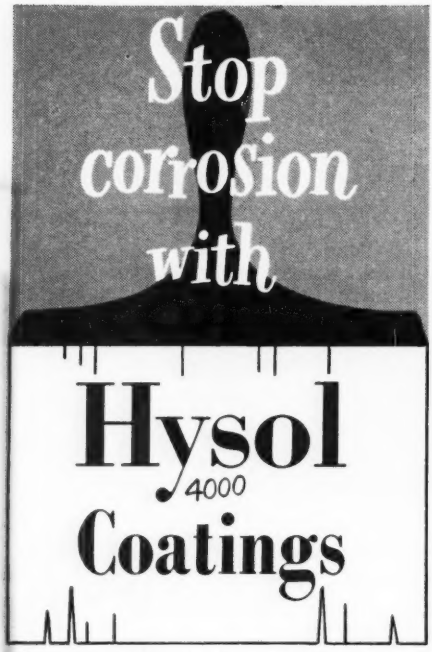

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oxidizing temperatures, such as some of the wire drawing lubricants, cannot be coated without additional pretreatments.

Equipment

The main features of the Sendzimir coating process consist of heating and cooling of the base metal, maintaining certain prescribed atmospheres at designated points, and immersing in the alloyed zinc bath at a suitable temperature. Such processing steps can be easily balanced and controlled with a high degree of precision under continuous operating conditions. Therefore, all components of the coating equipment must be so selected and arranged that a continuous flow of material through the unit can be maintained consistently.

If the equipment permits sustained operations at a scheduled rate of speed without stops or slow-downs, an amazingly uniform product quality can be obtained.

Equipment on the feeding end must uncoil incoming strip and feed it into the coating line at a designated constant speed under specified tension. It also must allow for joining of the coils without affecting the speed of the unit.

Generally, this equipment consists of one or two pay-off reels, auxiliary pinch rolls which manipulate the ends of the two coils during the joining operation, a shear, a welding unit, a looper, a tension device, and main feeding pinch rolls.

The looping device must be of a sufficient capacity to permit all steps of the coil joining operation to be performed when the unit is operating at its greatest speed. The tension device must regulate the tension of the strip in the furnace according to variation in thickness and width of the strip. The tension must be sufficient to guide the strip through the various components of the complete coating unit but not so great as to stretch or break the strip on the furnace.

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Furnaces

The preheating furnace must preheat the strip uniformly to a designated temperature. The furnace capacity must be sufficient to heat the widest strip to be coated. High temperature, direct-firing gas burners have been found to be well suited for this furnace, because they give maximum energy release per unit hearth area.

The annealing furnace (Fig. 2), placed in line with the preheating furnace, must complete heating the strip under a reducing atmosphere to the annealing temperature. The heating capacity of this furnace should be sufficient to attain the maximum specified temperature at the maximum rate of production.

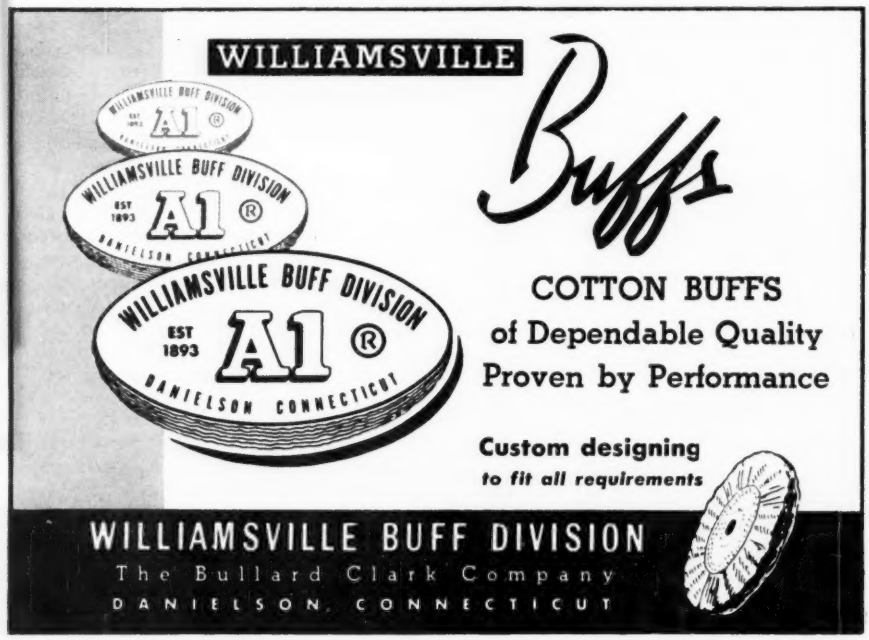
The need for closely controlled atmosphere composition makes necessary specially designed furnace elements such as the entry door, shell, brick work, and hearth conveyor. Open flame burners should not be used in this furnace.

Gas fired radiant tubes or electric elements, driven hearth rolls of a suitable alloy and with properly sealed bearings, and automatic controls are typical features of the annealing furnace.

The cooling furnace is directly connected to the annealing furnace and extends to the zinc bath with its end sealed by molten zinc. The purpose of this furnace is to control the rate of cooling of the strip in a non-oxidizing atmosphere.

Since the rate of production is variable with the width of the strip, the quantity of heat to be dissipated is also variable. The cooling furnace must compensate for these differences so that the temperature of the strip on entering the zinc bath is essentially constant regardless of the width of strip.

Any air infiltration in the final sec-



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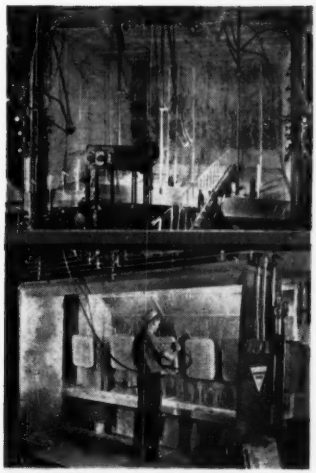

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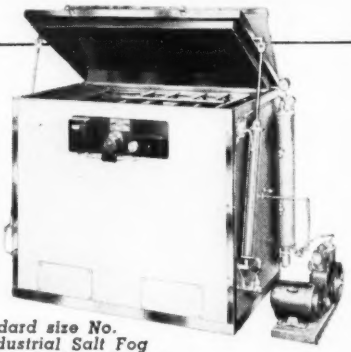

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tion of the cooling furnace would reoxidize the strip and spoil its welding characteristics. Therefore special precautions must be taken in the design and construction of this section to avoid this hazard. Complete elimination of hearth roll out-board bearings in the final part of the cooling furnace has been found to be mandatory.

The pot furnace, which surrounds the zinc bath, must supply heat for initial melting of the zinc and also heat for maintenance of a uniform zinc temperature during normal operating conditions.

An electrically heated pot furnace serves most satsisfactorily in this application. Under operating conditions essentially all of the heat required for heating and melting of the zinc and for radiation losses is supplied by the incoming strip. Only a small amount of the heat necessary to balance the zinc bath temperature is derived from the pot furnace.

Pot and Pot Equipment

As this process does not require heating the strip in the bath or any specified time of immersion for wetting and bonding, the size of the pot can be very small. It must however, contain strip-guiding and finishing equipment and also must have space for accumulation of dross. With adequate pots, drossing is necessary only every 10 to 12 weeks. The very slow rate of dross formation in this process allows the use of a zinc pot with a capacity of only 5 to 7 tons of zinc per average rated ton of hourly capacity.

The amount of dross formed in a given time in this process, in which the temperature of the strip is closely controlled at the point of immersion, depends primarily on the length of travel through the zinc. The influence of speed or amount of metal moving through the pot is rather insignificant.

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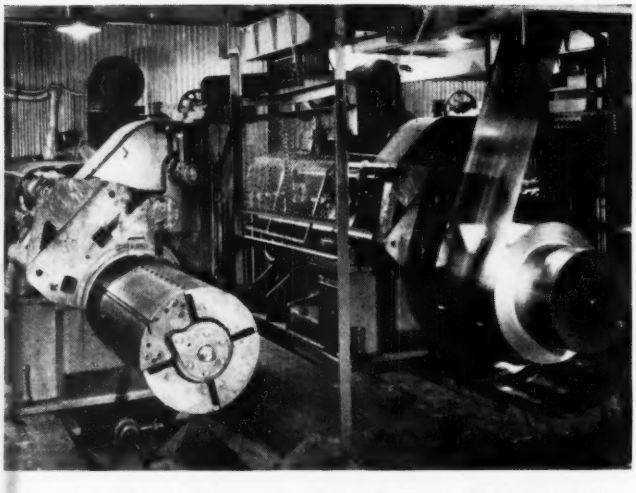

Fig. 3—Receiving end of the compact ZINC-GRIP line showing the double coiler unit.

is required, ingot iron or fire box steel offers a greatly increased pot life in this service as compared with ordinary galvanizing operations.

A submerged idling roll is generally used for guiding the strip through the zinc bath. A suitable scraping device prevents excessive and non-uniform build-up of iron-zinc alloy on the surface of this roll, and, as a result, no redressing is required during the operating period between drossings.

Exit rolls, common to the best galvanizing operation, serve as a means of regulating the weight and uniformity of the coating. A mechanical scraping device is attached to the exit rolls to prevent deposition of oxide and dross on the surface of the coated strip. Service life of the exit rolls between redressings is 10 to 12 days.

Delivery End

The delivery end (Fig. 3) of this type coating operation must provide: (1) sufficient time for the formation of the spangle; (2) rapid cooling of the coated strip so that no flexing or bending of the strip occurs at high temperatures; (3) absence of sharp or reverse bends in the pass line of the strip to avoid the hazard of coil breaks; and (4) sufficient looping devices to avoid interruptions in the constant coating speed.

The main set of pinch rolls, which establishes the coating speed of the line, pulls the strip through the furnaces and pot equipment. It is installed far enough from the pot to avoid damaging the coating or base metal. The speed of this set is changed with the changes in the gauge of the strip.

Roller leveling, oiling, rejection separation, stenciling, coiling, and shearing equipment are generally incorporated in the unit. Consequently most of the coated material is ready to ship as it leaves the coating line.

Temper rolling, slitting, and phosphatizing which can be carried out at constant high speeds regardless of the thickness of the strip are generally separate operations.

Auxiliary Equipment

Dissociated anhydrous ammonia (75 per cent hydrogen—25 per cent nitrogen by volume) serves as a satisfactory reducing atmosphere in the annealing furnace and as a non-oxidizing atmosphere in the cooling furnace.

A liquid ammonia storage tank with a holding capacity of one to two carloads and an ammonia dissociator with a capacity of 1,000 to 2,000 cubic feet of dissociated gas per hour are adequate to supply the atmosphere needs. The required capacity of the ammonia dissociator depends largely on the width of the unit and the method of

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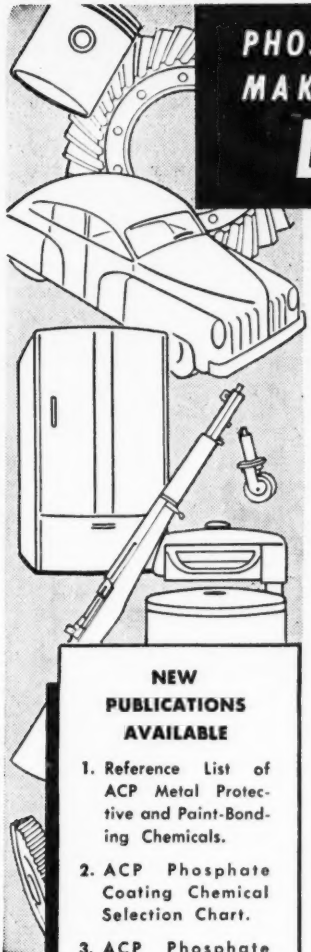

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sealing the entry to the reducing furnace.

Operation

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Continuity of the operation, as has been stressed, depends upon proper equipment but it also imposes definite requirements on operating personnel. Regardless of how good and how complete the equipment is, it cannot be operated with greatest efficiency unless every operator is properly trained. He must perform his assigned duties in a competent manner both as an individual and as a member of an operating team. And the team includes not only men of the operating crew but also maintenance men and men in charge of metallurgical quality control.

Operators, maintenance men, and metallurgists must be familiar with the principles of the processing and with their mutual duties before interdepartmental cooperation can be developed and every individual can contribute fully to the most efficient overall operation.

It is not practical to start this type of process slowly or operate at reduced speed while the operators are acquiring the necessary training and the equipment is being synchronized. Proper rates of heating and cooling and the desired balance of temperatures throughout the processing equipment cannot be obtained at reduced speeds. Also, an inferior quality product is produced.

A better procedure is to synchronize the equipment and familiarize the men with their functions while running the equipment without heat in the furnaces or molten zinc in the pot.

After training the crew and adjusting the equipment, zinc is melted in the pot, the furnaces are preheated

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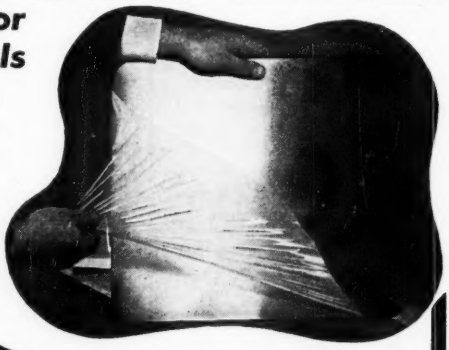

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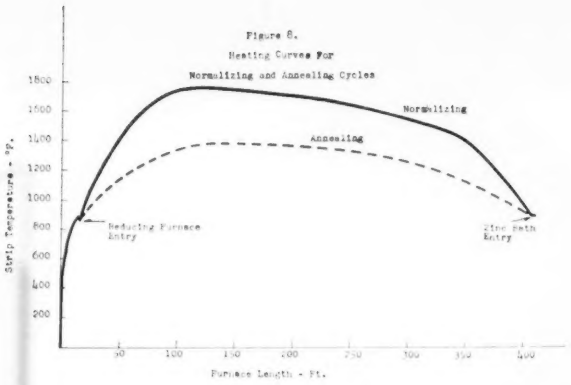


Fig. 4 — Heating curves for normalizing and annealing cycles.

and the atmosphere is introduced in the cooling and reducing furnaces. Then the unit is threaded, temperature settings adjusted, and operations started at full rated speed. The same procedure is employed after drossing or complete shutdowns.

The line speed is changed according to the thickness of the strip so that a constant weight per hour is produced for a given width.

Tension of the strip between the feeding and the main pinch rolls is adjusted for variations in the width and thickness of the strip.

Operation of the oxidizing furnace is controlled to produce strip temperature at the exit end of the furnace in the range of 750 to 850 deg. F. The firing pattern of the furnace is adjusted for strip widths to ensure uniformity of surface oxidation across the width of the material.

The temperature in the reducing furnace is controlled automatically and set according to the heating cycle. The rate of temperature decrease in the cooling furnace is also maintained automatically by temperature controls for individual zones in the furnace. The cooling or heating media are engaged automatically enabling the strip to arrive at the pot at the desired temperature range of 900 to 950 deg. F.

Either normalizing or sub-critical annealing cycles can be used in the process. Normalizing and annealing cycles with controlled cooling are shown in Figure 4. These indicate the strip temperature at various locations in the furnace. Somewhat better and more uniform physical properties of the base media can be obtained when a normalizing cycle is used.

The temperature of the zinc bath is maintained in the range of 850 to 860 deg. F. It is essential that fluctuation of the zinc temperature be avoided. Increased temperature causes greater solution of iron in the zinc; then as the bath temperature drops, the iron comes out as a fine dross in the coating.

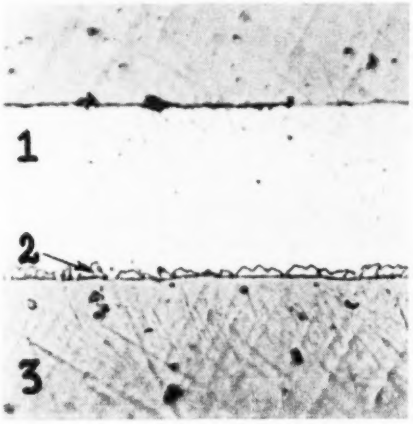
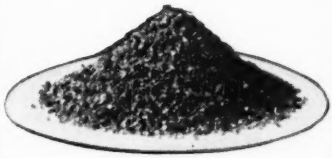
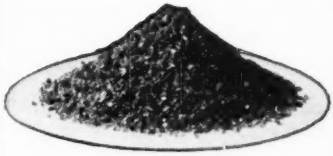


Fig. 5—Microstructure of the ZINCGRIP coating.
1. Zinc coating.
2. Zinc-iron alloy.
3. Base metal.

POLISHING



TUMBLING



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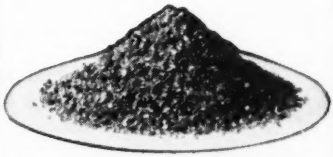

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Table I

BASE METAL	Yield Strength Lbs./Sq.In.	Tensile Strength Lbs./Sq.In.	% Elongation in 2 inches	Rockwell Hardness B-Scale
Ingot Iron	35,000-45,000	50,000-59,000	20 - 27	55 - 70
Copper Steel	40,000-45,000	52,000-57,000	23 - 30	58 - 68
Mild Steel	37,000-45,000	52,000-57,000	25 - 30	58 - 65

The aluminum content of the bath is maintained by the addition of zinc-aluminum alloy (10 per cent Al) in the amount of about two pounds of aluminum per 1000 pounds of added zinc.

Coating weight is regulated by adjusting the position of the center-line of the exit rolls with respect to the level of the molten zinc in the bath, just as in conventional galvanizing.

ZINCGRIP

The commercial zinc coated product, manufactured by Armco Steel Corporation using the Sendzimir Coating Process, is well known as Armco ZINCGRIP. It was first introduced on the market in 1936.

The recognized properties of this material are: (1) tenacious adherence of the zinc coating, (2) attractive lustrous appearance, and (3) excellent forming properties of the coating as well as base metal.

It is produced in cut length sheets and coils in thicknesses from 0.018 to 0.115 inch and in widths up to and including 48 inches. It can be produced in any specified weight of coating up to 250 oz./sq. foot.

A Bonderized surface is supplied when paintability and improved paint adherence are required. Material so treated is known as Armco ZINCGRIP PAINTGRIP.

The average mechanical properties of the base metal are listed in Table I.

The reason for the unusual properties of the coating can be found in its metallographic structure (Fig. 5). The complete elimination of the most brittle iron-zinc alloys and the restricted formation of the other less brittle iron-zinc alloys results in excellent adherence and ductility of the coating. No separation of the coating from the base metal occurs even under severe

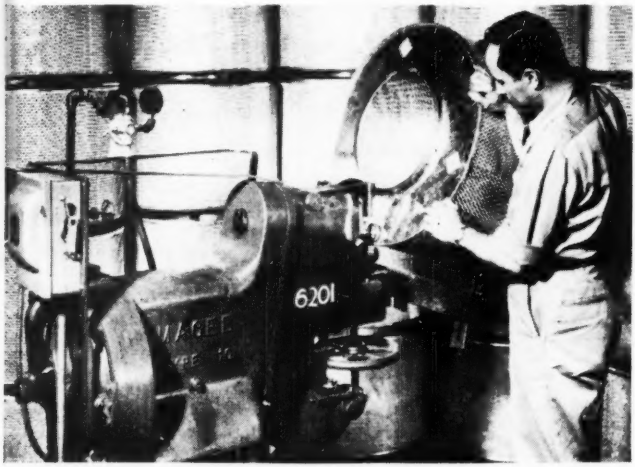
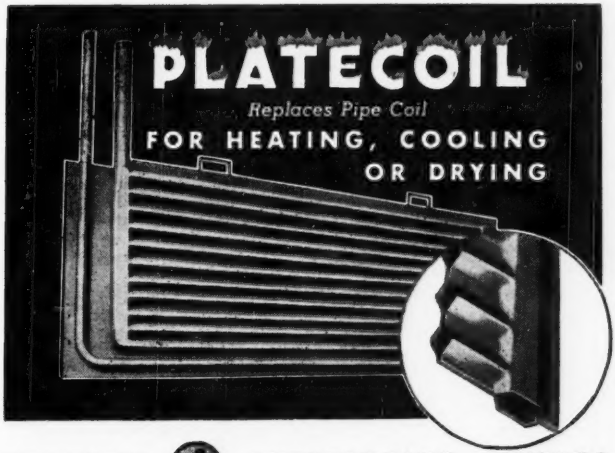


Fig. 6 — Expanding the flange of a ZINCGRIP drum for a domestic automatic laundry drier.



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EASY INSTALLATION

By the use of "quick change hangers" Platecoil installations can be made in open tanks in one-half hour or less by one man and a helper.

NO THREADED JOINTS IN TANK

The entire Platecoil is electric welded and pressure tested. There are no joints to corrode or leak. Both connections to the Platecoil can be located above the liquid level where there is no danger of thread corroding and freezing.

GREATER TANK CAPACITY

A 22" x 47" Platecoil gives the same heat transfer surface as 32 feet of 1½" pipe. This pipe requires a space approximately 30" x 60". Platecoil thus saves about 50% over equivalent pipe coil.

TANK MAINTENANCE WITHOUT LOSS OF SOLUTION

There is no need for workmen to get inside the tank in order to make replacements or repairs. A Platecoil can be removed in a matter of minutes with the solution still in the tank.

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WEIGHS 50% LESS

Weighing only about half as much as equivalent pipe coil, Platecoil is easy to handle. A whole maintenance crew is not needed to transport and install Pipecoil.

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forming, spinning, and deep drawing operations. (Fig. 6 and 7).

Annealing and coating in a continuous manner result in a remarkable product uniformity, especially in mechanical properties of the base metal and in weight, distribution, adherence, and ductility of the zinc coating.

The outstanding coating adherence

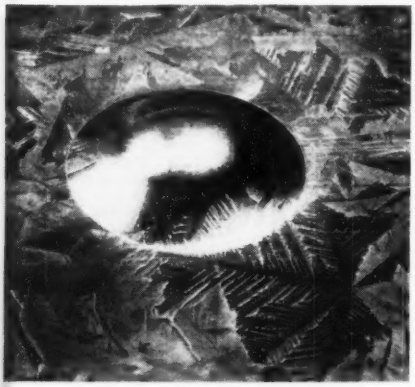

Fig. 7—A standard laboratory indentation has no effect on the ZINCGRIP coating. The zinc adheres to the base metal despite severe stretching.
(Photos courtesy Armco Steel Corp., Middletown, Ohio)

and workability of the zinc coated product manufactured by the Sendzimir coating process has led to a much broader application of galvanized sheets and coils. It can be used for many products which formerly had to be hot dipped after fabrication.

Adherence of the coating produced by the Sendzimir coating process is sufficient to withstand drawing and forming operations to the limit of the drawing ability of the base metal without peeling.

Quality of product, economy of operation, and healthful working conditions in the shop—all have led to the rapidly increasing use of this process for the galvanizing of iron and steel sheets.

Correction

In the article "Processing Cycles for Chromium Plating" by Jerome L. Bleiweis, published in the May issue of PRODUCTS FINISHING, the author lists the following process for the plating of aluminum alloys:

1. Preclean by vapor degreasing.
2. Alkaline clean by soaking in an aluminum cleaner.
3. Rinse in cold water.
4. Etch in chromic-sulfuric acids or in caustic soda (for cast alloys).
5. Rinse in cold water.
6. Dip in nitric-hydrofluoric acids or in nitric acid (for wrought alloys).
7. Rinse in cold water.
8. Zinc immersion dip for 2 seconds to 5 minutes, depending upon rate of formation of the zinc coating.
9. Rinse in cold water.
10. Cyanide copper plate.
11. Rinse in cold water.
12. Nickel plate.
13. Rinse very thoroughly in clean, running, cold water.
14. Chromium plate.
15. Drag-out rinse.
16. Rinse, cold, hot and dry.

Information furnished by the Aluminum Company of America points out that Step 4 should be: 4. Etch in 25 per cent sulfuric acid for about 5 minutes at 180 deg. F. (for wrought and most cast alloys). For wrought alloys of the 2S and 3S types, for Steps 2, 3, and 4 may be substituted a 1 to 3-minute etch in a solution of 3 per cent sodium carbonate and 3 per cent trisodium phosphate at 140-180 deg. F. This treatment is followed by a cold water rinse and a dip in 1:1 nitric acid.

Step 6 should read: Dip in nitric-hydrofluoric mixture.

Likewise, in Step 10 it is preferable to use a Rochelle cyanide copper solution than the ordinary cyanide copper which the author listed in the article.

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Practical Methods for Treatment of Plating Room Wastes

By DR. ALLEN G. GRAY

PRACTICAL methods for disposal of plating room wastes have grown vastly in importance to the average plater in the last few years. Stream pollution, impairment of sewage system efficiency, and damage to sewage disposal mechanisms may result from improper disposal methods; in many localities legislation enforcement is becoming more vigorous. In consequence, the plater faced with the immediate need for waste treatment in an existing plant should reconcile himself to the fact that waste treatment is another operating expense which must be added to the cost of production. Thus, it is important that each plant decide which of the practical methods available for waste treatment is most suitable, based on such factors as the types of plating carried out in the plant, local conditions, and the economic factors of plant investment and operating costs.

Processes being used for treatment of wastes commonly incurred in plating operations was one of the subjects discussed at THE FIFTH INDUSTRIAL WASTE CONFERENCE held recently at Purdue University. At this meeting, C. F. Waite, King-Seeley Corporation, Ann Arbor, Michigan, presented practical details on methods for treatment of acid and alkali, cyanide, chromium, nickel, and other wastes.

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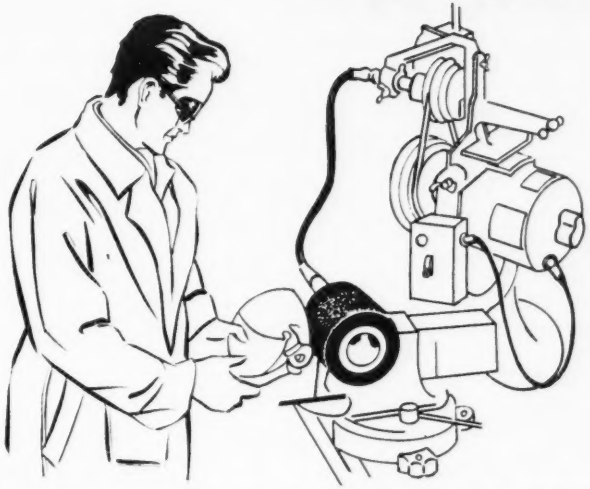

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Also, in this connection, J. E. Tarman, M. U. Priester, W. H. and L. D. Betz, discussed the treatment and disposal of cyanide bearing wastes.

Figure 1 shows the general layout of the waste system used at King-Seeley Corporation. The plating machine is surrounded by 4 trenches. Trenches 1 and 4 are the acid-alkali trenches. All acid, alkali, and roto-finish wastes flow into Trenches 1 and 4 which eventually combine into one drain. All cyanide wastes are collected by Trench 2 and all nickel and chromium wastes are diverted into Trench 3. Waite pointed out that there are barricades around the copper cyanide solution filters and heat exchangers to prevent cyanide solution from getting into any trench other than 2. The design is such that there are no drains in the plating room other than these trenches. Six-inch drains lead from the plating room trenches to the waste disposal building. They are 400 feet long and have a drop of 3 feet in 400 feet. The acid-alkali drain, 1 and 4, by-passes the waste disposal building and enters a trench at the rear of the building. The cyanide drain, which is 2, and the chromium drain, which is 3, enter the waste disposal building and are treated. These treated wastes then flow into the trench at the rear of the waste disposal building with the acid-alkali and roto-finish wastes.

By a system of gate valves these treated wastes can be made to flow into either Lagoon 1 or Lagoon 2, as is shown on Fig. 1. It was stated that Lagoon 1 is an old lagoon having sloping earthen walls, with maximum dimensions of 40 feet by 90 feet, with

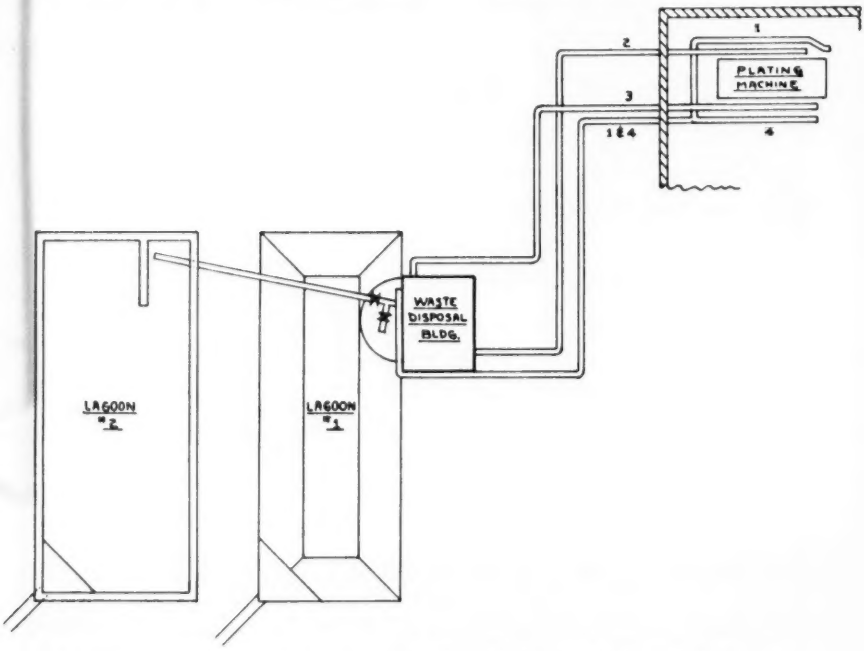

Fig. 1—General layout of the plating waste disposal system used at King-Seeley Corp., Ann Arbor, Michigan.

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an effective depth of about 4 feet. Lagoon 2 is constructed of concrete, and is 40 feet by 90 feet with a maximum depth of 6.5 feet. The bottom has a 6-inch slope toward the influent end with a sump there for the removal of sludge. It also has an adjustable weir.

Figure 2 gives a diagrammatic view of the adjustable weir of Lagoon 2, showing the skimmer and the baffle which is 5 feet high. It was pointed out by Waite that the normal operating weir is 4 feet high, which provides a normal operating capacity of 110,000 gallons in this lagoon. When plating is shut down for the day or for the week-end, the gate valve is closed. The height of the second weir is 6 feet; this, in effect, raises the capacity of the lagoon to 160,000 gallons. It was emphasized that this additional capacity is greater than the combined volume of all the plating tanks at King-Seeley. Thus, no matter what combination of breaks might be encountered the material would be caught in the lagoon and would not reach the river. Steps would then be taken to treat the waste in this lagoon while running normal plating operations with the other lagoon. It was also pointed out that it is possible to alternate lagoons while desludging either of them.

Acid-Alkali Wastes

According to Waite, in his discussion before the Purdue Waste Conference, disposal of acid-alkali wastes at King-Seeley Corporation, consisting of 74,000 gallons per 16-hour working day, at pH of about 10, presented no serious problem, merely one of neutralization. The other wastes, such as cyanide, chromium and nickel, required more specific treatment methods. The roto-finish waste (390 gal./hr.) was stated to consist of a mixture of soaps, both soluble and insoluble, and particles of metallic zinc. These result from a tumbling process used to surface finish zinc die castings preparatory to plating. In this

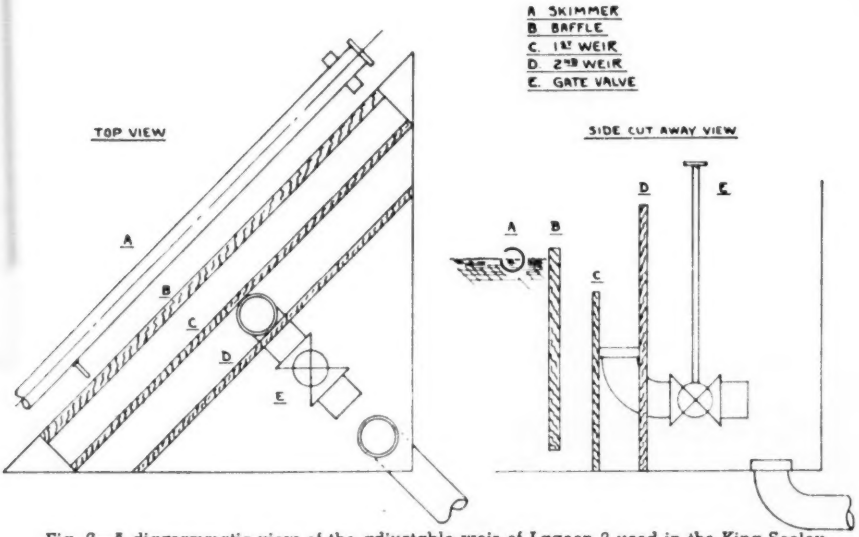

Fig. 2—A diagrammatic view of the adjustable weir of Lagoon 2 used in the King-Seeley Corporation waste disposal system.

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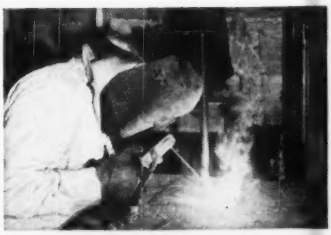

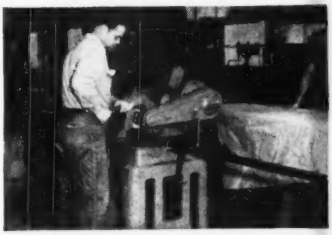

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case, the insoluble floating material is skimmed from the surface, and the remainder allowed to mix with the acid-alkali wastes, needing no further treatment.

Other methods for treating wastes

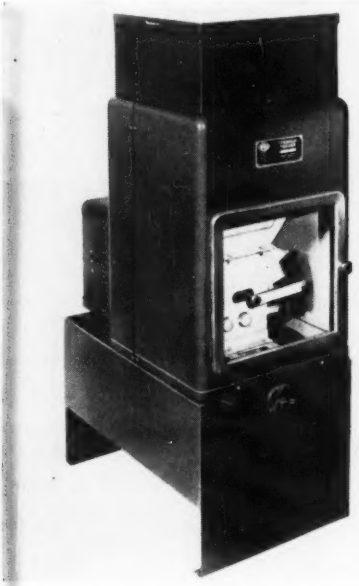

Fig. 3—A dry chemical feeder that may be used for neutralizing acid wastes with lime. (*Photo courtesy INFILCO, Inc., Chicago, Ill.*)

requiring acid neutralization have been discussed. Generally, lime or limestone is used for this purpose; the relative cost and neutralizing power have been studied in detail (see **Ind. Eng. Chem.** 40, pp. 2062-2067, (1948). Treating plants where acidic wastes are passed up-flow through beds of crushed limestone have been described. In general, high calcium lime has been favored for the neutralization of these acidic waste solutions. For small plants, the installation of a dry feeder for neutralization, such as shown in Fig. 3, may afford the simplest solution to this problem. Where larger quantities are involved, the purchase of quicklime and the installation of a lime slaker will generally be more economical. Commercial equipment is available for lime slaking and feeding into liquors to be neutralized.

Disposal of Cyanide Wastes

In discussing methods used for cyanide waste treatment at King-Seeley Corporation, Waite pointed out that four of the available methods were investigated, before deciding on which one to adopt for plant use. These were: (1) acid treatment; (2) ion exchange; (3) electrolysis and (4) oxidation methods. The treatment problem at King-Seeley involved about 25,000 gallons per 16 hour working day of waste containing 12 to 20 p.p.m. of potassium cyanide.

Concerning the acid treatment method, Waite stated that aside from the poisonous character of the hydrogen cyanide which is given off in the treatment process, several other disadvantages were encountered. This treatment method generally involves adding an acid (usually sulfuric) and bubbling air through the acidified waste to carry off the hydrogen cyanide which is evolved. Among the drawbacks cited was that the process is a batch process, utilizing rather large and expensive equipment and storage tanks. Also, several hours were necessary to reduce the cyanide, and difficulty was experienced in removing the last few p.p.m. of cyanide from the wastes being treated.

Platers wishing to look into the acid treatment method for cyanide disposal will be interested in a recent description of typical treatment plants of this type in use at Kaiser-Frazer in Willow Run, Mich., and the Chevrolet plant at Flint, Mich. ("The Iron Age," June 16, 1949). In the methods used, the waste cyanide solution is discharged to a reaction tank which is tightly sealed and rubber lined or otherwise protected. The reactor is

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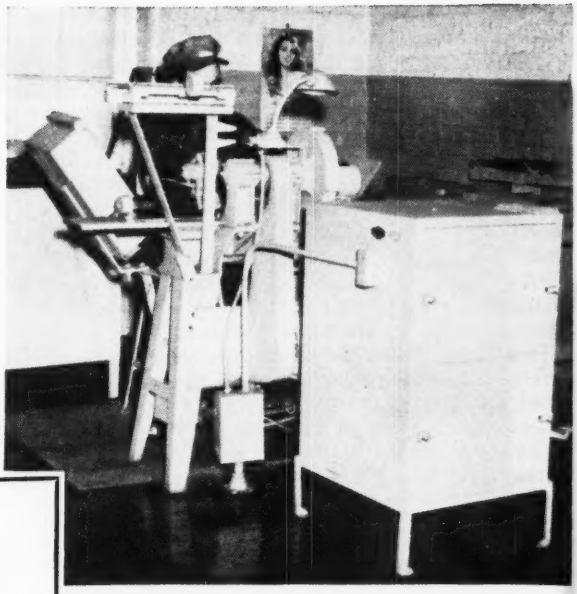

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equipped with an air blower and ventilating stacks. Sulfuric acid is added and the contents are agitated by compressed air. The cyanide is volatilized as hydrogen cyanide gas which is vented through the high stacks, aeration continuing for about 16 hours.

In discussing the electrolysis method for cyanide disposal, Waite emphasized that it utilized all the bad plating practices possible. The waste solution to be treated is heated nearly to boiling, violently air agitated, and electrolyzed at a high current density. It is advisable that the anode area be several times the cathode area. Under these conditions, the cyanide is converted to a variety of harmless products. According to Waite, the process is only practical for high concentration wastes, and rinse waters would have to be collected and concentrated before they could be effectively treated by this method. Another disadvantage pointed out was that the process is lengthy; 24 hours or more may be necessary to destroy the cyanide to the point that the waste may be dumped. Also, according to Waite, it is difficult to remove the last few p.p.m. of cyanide, and large storage and concentration tanks are necessary, as the process is a batch process.

Two reports have recently appeared in connection with the electrolytic method for cyanide disposal. ("Plating," April 1949). In one, R. W. Oyler described the use of this method for treatment of sludge from cyanide copper baths and discarded copper strike solutions at the plant of Guide Lamp Division, General Motors Corporation, Anderson, Ind. In handling the cyanide bearing sludge, it is washed with water by decantation a sufficient number of times until the wash solution is free of cyanide, so it can be dumped. The cyanide-containing wash solution is transferred to a tank in which the electrolysis is to take place. Condi-

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tions recommended by Oyler for maximum rate of cyanide decomposition by the electrolytic method are as follows: (1) Solution very hot (200 deg. F.); (2) Vigorous air agitation; (3) Use of copper electrodes; (4) As high a current density as possible; (5) High ratio of anode to cathode area. The conditions used in plant practice resulted in total cyanide destruction at the rate of about 1 oz./gal./day—the rate being much higher for high concentrations and diminishing as the cyanide concentration approached zero.

In the second of the recent reports cited above, L. B. Sperry and M. R. Caldwell, Jarvis Division, Doehler-Jarvis Corp., Grand Rapids, Mich., described laboratory experiments and plant trials on the electrolysis method for destroying cyanide copper solutions that are to be discarded. A 700 gallon solution was used in the plant run, which employed a tank size of 10 x 2½ x 4 feet deep; cathode and anode area totaled 72 sq. ft., equivalent to 0.1 sq. ft./gal. The generator capacity was 500 amperes at 6 volts, giving an average current density of 35 amp./sq. ft. The solution temperature was maintained at 175-195 deg. F. The time required to remove copper was about 18 hours and about 35 hours was required to destroy the cyanide. Sperry and Caldwell pointed out that the plater may find this method advantageous for destruction of rather concentrated cyanide solutions that are to be dumped; in addition, it may be possible to utilize equipment already available in the plant and the method is one with which the plater is already familiar.

The third process for cyanide disposal investigated by Waite was the ion exchange method. It was pointed out that this method whereby cyanide wastes are filtered through a suitable resin presents an excellent concentration method, as the resin absorbs the cyanide. However, upon regenerating the resin the cyanide is again awaiting disposal. As a result, it has limitations as a process for ultimate disposal of cyanide wastes.

The oxidation method using chlorine or a hypochlorite was the fourth method investigated by Waite for cyanide destruction. Using chlorine, this process presented the advantages of a continuous flow treatment method. It also had the advantages of destroying the last few p.p.m. of cyanide as quickly as higher concentrations. In the chemical reactions involved in this method, the oxidation proceeds in 2 steps in the alkaline medium maintained. In the first step the cyanide is oxidized to cyanate. Theoretically, 2.73 weight units of chlorine are necessary to oxidize 1 weight unit of cyanide to cyanate. In practice, about 4 weight units of chlorine are used. If sufficient chlorine is available, the cyanide is completely oxidized to carbon dioxide and nitrogen. This re-

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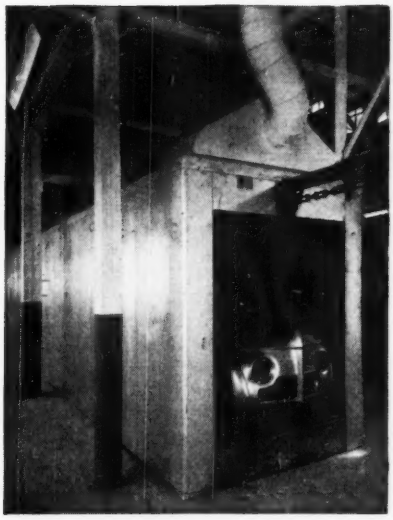

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action is complete in about ½ hour. For the complete oxidation, theoretically, 6.83 weight units of chlorine are necessary to oxidize 1 weight unit of cyanide. In actual practice, according to Waite, 8 weight units of chlorine are generally used. The pH of the waste treatment batch should be kept over 8.5. It was pointed out that in some cases, because of the lower toxicity of cyanates, the oxidation is carried only as far as the first step.

In applying the chlorination method to the treatment of 25,000 gallons of dilute cyanide waste solution per day at King-Seeley, the wastes are permitted to flow into a 1900-gallon tank, and a water slurry of soda ash is added from a feeder. An agitator mixes the soda ash and the cyanide waste solution thoroughly. After a holding time of about ¾ hour, the alkaline waste flows by gravity into a distribution box. Chlorine is metered and dissolved in water in a chlorinator, and this chlorine solution is also fed to the distribution box. The mixture of alkaline cyanide waste and chlorine water then flows by gravity from the distribution box into one of two reaction tanks, each of which is baffled and has a capacity of about 2,325 gallons. These tanks are used alternately so that the one not in use may be cleaned. After the waste is held in a reaction tank for more than an hour, the oxidized waste, now free from cyanide, is permitted to flow into the waste disposal lagoon.

One important fact brought out by Waite in discussing the operation of this method before the Waste Conference is that certain inspection procedures must be established to determine the rate of feed for the chlorinator and dry feeder. The wastes in the cyanide trench at the plating room are checked periodically to determine the cyanide content and the pH. With this information, feeder and chlorinator may be adjusted to feed soda ash and

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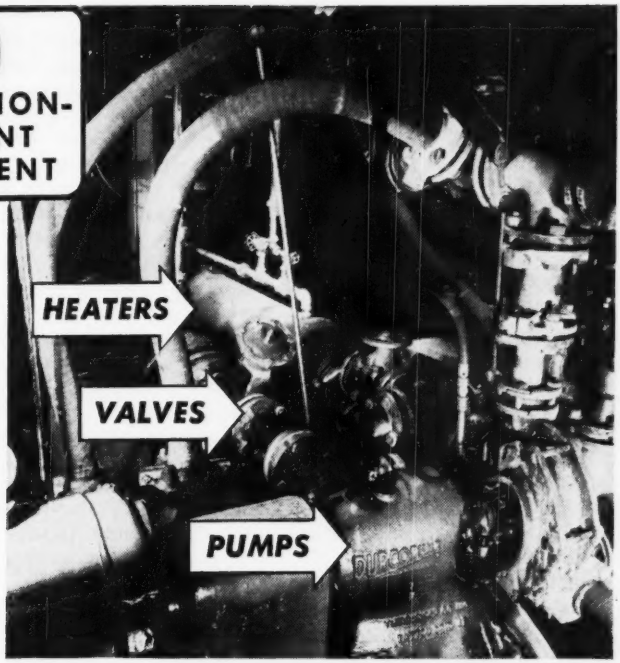

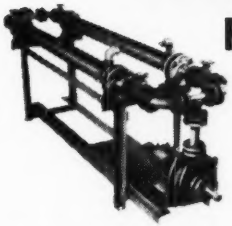

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chlorine, each at the proper rate.

Details of a number of commercial installations using the chlorination method for disposal of cyanide waste from plating operations were also given before the Waste Conference by J. E. Tarman and M. U. Priester, W. H. and L. D. Betz, Consulting Division, Philadelphia. In one case cited, where batch treatment was used, a solution of calcium hypochlorite was added in sufficient quantity to yield a stable residue of approximately 1 p.p.m chlorine by the OTA test. However, it was pointed out that in most cases of waste treatment gaseous chlorine can be used to an economic advantage, adding caustic if necessary to maintain the pH above 8.5. As a general rule, the approximate dosage recommended is in the ratio of 10 parts of chlorine for each part of cyanide in the waste.

One important point brought out by Tarman and Priester is the importance of taking steps to minimize wastes to be treated, whenever this is possible. One example cited was that of a plating plant which was using 40 gal./min. of rinse water on a continuously flowing basis. Difficulties and costs involved in collecting and treating this quantity of waste directed detailed study to this phase of the operation. As a result, a system of batch dumping of rinse waters was adopted, and the total quantity of wastes containing cyanide was reduced to 250 gal./week. Since most rinse water contamination is a direct function of the amount of dragout from plating or similar baths, extra efforts to minimize dragout are warranted. Reductions of this type may be accomplished by allowing suitable drainage prior to rinsing, the use of blasts of air to remove adhering liquid, a rather appropriate practice. Many plants employ flowing rinse baths in which work is manually dipped at infrequent intervals. This practice results in mild contamination with cyanide of relatively large volumes of water presenting a treatment problem out of proportion to the actual operation. Foot-controlled valves at the rinse tanks will materially reduce the amount of waste solution to be treated.

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Chromium Wastes

The waste treatment setup at King-Seeley also involves the handling of some 100,000 gallons per 16-hour day of waste from chromium plating operations containing from 12 to 16 p.p.m. of hexavalent chromium. The nickel wastes are combined and treated with the chromium wastes. The first procedure used for treatment of these wastes, according to Waite, involved adjusting the pH to 4.5 or below with sulfuric acid, reducing the hexavalent chromium to the trivalent state with ferrous sulfate, followed by precipitation with lime. It was pointed out, however, that after sev-

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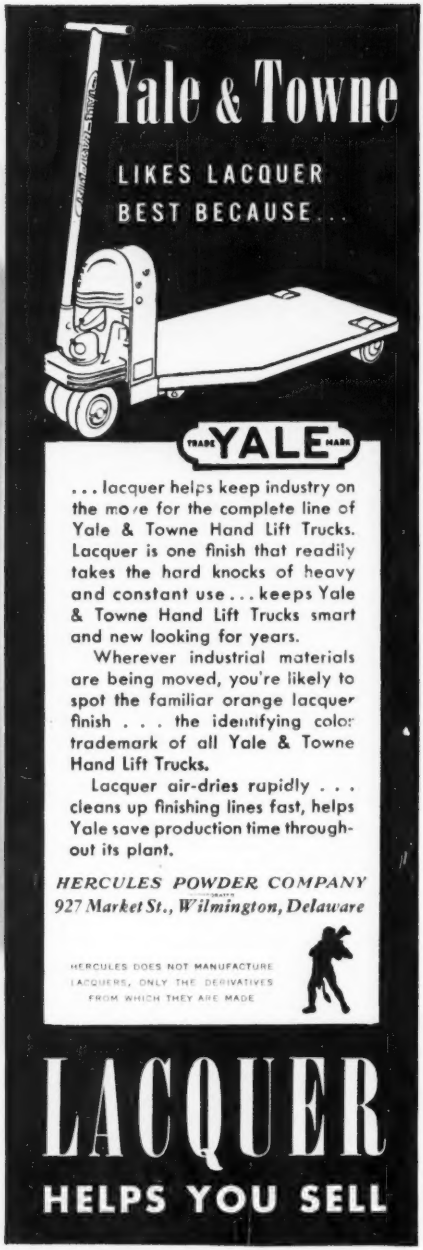
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eral months of operation of this process it was found that the reduction of the hexavalent chromium to the trivalent state could be done more inexpensively with sulfur dioxide.

Chromium wastes to be treated flow into a 1500-gallon tank into which a proportioning pump feeds sulfuric acid and a sulfonator supplies sulfur dioxide. The resulting mixture is thoroughly agitated to speed the reduction of hexavalent chromium to trivalent chromium by the sulfur dioxide. The treated waste flows by gravity into another tank to which lime is supplied from a feeder, and the mixture is violently agitated mechanically. The lime precipitates the trivalent chromium, and the resulting slurry is allowed to flow into the waste disposal lagoon for settling. The proportioning pump must be adjusted so that pH of the waste is kept below 4.5.

The last few years have brought many advances in practical methods for plating waste treatment. If a system of efficient water and chemical utilization is maintained in the plant it will be found, in most cases, that the addition to the unit cost of the product, as a result of practical waste treatment, will not be very great.

* * *

Chemical Brightening of Aluminum

THE fact that certain acid solutions will brighten, while others will merely etch wrought aluminum alloys was one point brought out by Walter R. Meyer and Steven H. Brown, Enthone Company, in discussing various aspects of cleaning, etching, chemical polishing and brightening of aluminum before last year's convention of the American Electroplaters' Society. This observation resulted in a research pro-

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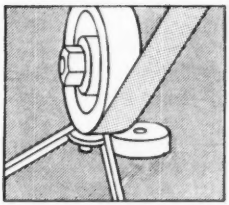

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TABLE I

Results Obtained in Chemical Polishing of Aluminum in Different Acid Mixtures Based on Studies Carried Out in Enthone Laboratories

Alloy Treated	Polishing Solution			
	Phosphoric Acid-Water	Phosphoric Acid-Water-Acetic Acid	Phosphoric Acid-Water-Nitric Acid	Phosphoric Acid-Water-Acetic Acid-Nitric Acid
2S-½H	Brightening to some polishing in 3 minutes	Slight brightening in 3 minutes	Brightening to polishing in 3 minutes	Brightening to polishing in 3 minutes
24S-T	Etching throughout 3 minute cycle	Brightening in 15 seconds but etching thereafter to end of 3 minutes	Brightening for 30 seconds but uneven attack with milky deposit for 1 to 3 minutes	Brightening changing to polishing within 3-minute range
52S-½H	Etching throughout 3 minute cycle	Brightening in 15 seconds and etching thereafter to end of 3 minutes	Brightening to polishing in 3 minutes	Brightening to polishing in 3 minutes

gram which was undertaken in the Enthone laboratories to determine how the action of an acid polishing solution differed from that of an acid etching solution.

The first studies made showed that mixtures of phosphoric acid, nitric acid, and water had the property of brightening and polishing when wrought aluminum alloys were immersed for varying lengths of time; conditions used involved 15 seconds to 30 minute dips at temperatures ranging from 210 to 280 deg. F. Studies were expanded to include the investigation of such mixtures with acetic acid added. Table I summarizes some of the observations made on the various mixtures investigated in the chemical polishing experiments.

In discussing chemical polishing of aluminum on an industrial scale, Meyer and Brown emphasized that such processes introduce to the finishishing man many new types of operating conditions and problems. A few problems cited were: vaporization losses, differences in brightness of different aluminum alloys, equipment, and drying bright surface without spotting. The three most important variables affecting the polish obtained on a given part are: the chemical composition of the polishing bath, the operating time, and temperature. In the practical operation of the process the finishing engineer is usually concerned only with the variation of time

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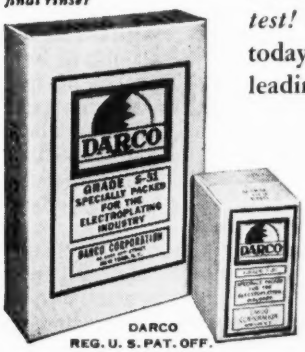

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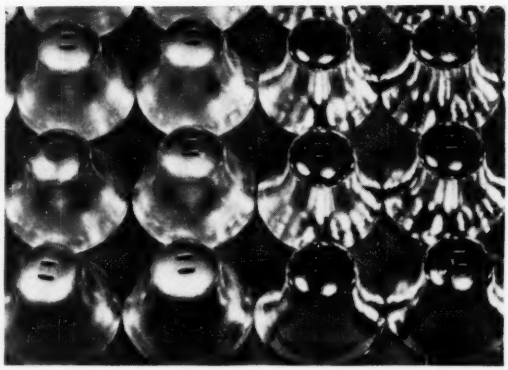

Fig. 5 — Alloy 3S aluminum bells before and after chemical polishing treatment; the polished bells on the right have a high degree of specular reflectance not shown by unpolished bells.
(Photo courtesy Enthone, Inc. and American Electroplaters' Society)

and temperature.

In developing conditions for chemical polishing of aluminum products, tests should be made in the plant using the actual parts to be finished, since spinning, drawing, and other forming operations may, in some cases, change the temper sufficiently to have an effect on the polish. The optimum cycle should be determined by dipping parts for varying lengths of time and at varying temperatures. The tank and all fittings, including racks, should be made of stainless steel. Good exhaust ventilation must be provided. A typical installation for chemical polishing of aluminum is shown in Figure 4.

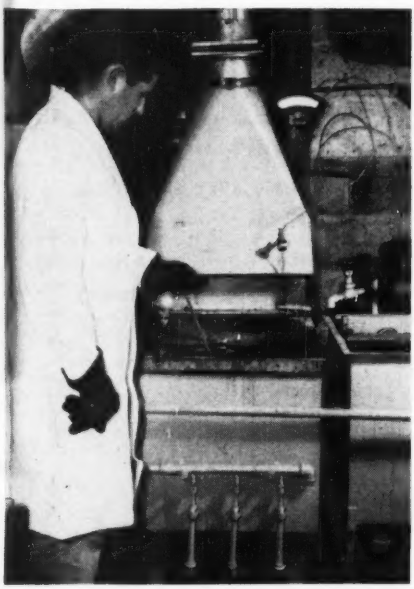

Fig. 4—Pilot plant installation at Enthone. Inc. laboratory for chemical polishing of aluminum.
(Photo courtesy Enthone, Inc.)

In discussing the characteristics of chemically polished aluminum surfaces, it was stated that the color of surfaces that had been properly finished resembled bright chromium plate. The method has found use in finishing operations where mechanical buffing is used for the first operation to eliminate deep scratches and imperfections. The chemical polishing treatment follows as the finishing step, leaving the surface with a clean brilliance. In other cases, where a finishing procedure is desired to replace mechanical methods, either because of cost considerations or because of unusual contours making buffing impossible, the chemical polishing method has been found to give a very attractive surface on the regular mill finished material. Shown in Fig. 5 are aluminum bells (3S alloy) before and after chemical polishing. The high degree of specular reflectance from the polished bells at right can be noticed.

Following the chemical polishing operation parts should be rinsed thoroughly. An anodizing operation may be carried out if improved corrosion resistance is required. This anodized sur-

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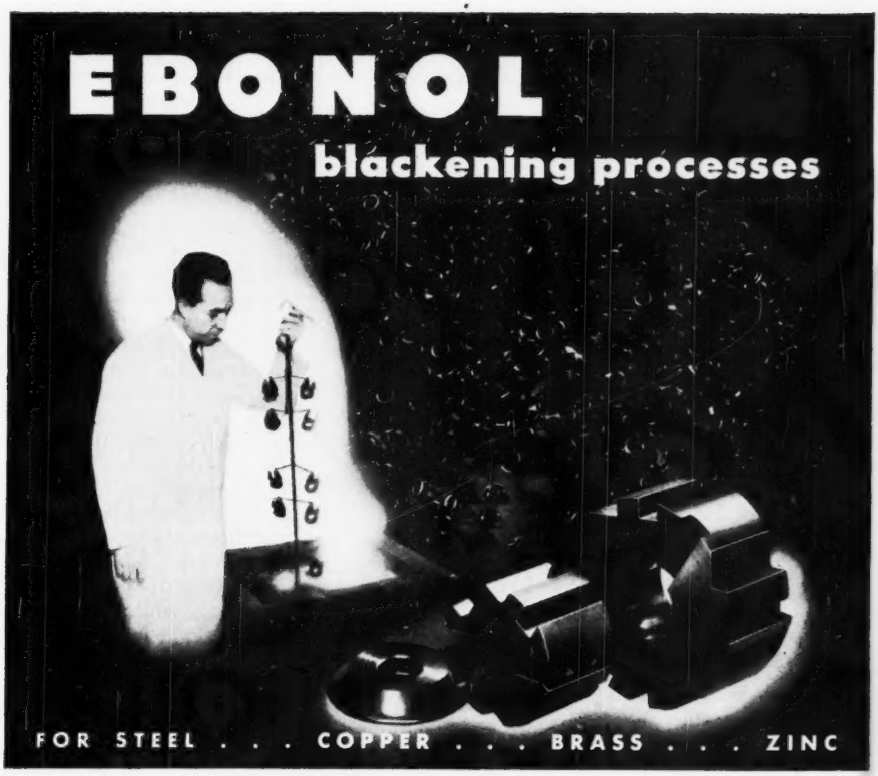

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face may be sealed or if added finish is desired it may be dyed. Organic films are also useful in protecting the highly polished surface from corrosion.

* * *

Protective Coatings Under Conditions of Continuous Condensation

CONTINUOUS condensation represents a moderately corrosive condition for protective, paint coatings, applied to structural members. The results of an investigation of paint system for the protection of steel under such conditions were recently reported by H. A. Pray and R. S. Peoples, Battelle Memorial Institute. The study which included testing of some 34 kinds of paint systems showed the performance of the red lead coating system to be outstanding under such conditions of corrosion. The findings, which were reported before the general American Iron and Steel Institute, were the result of a study undertaken as a part of the research program initiated by the Technical Committee on Protective Coatings. As pointed out by Pray and Peoples, its primary objective was to evaluate paint coatings by laboratory testing under environmental conditions simulating those which may be encountered during the life of steel housing units. (See also "The Iron Age", October 20, 1949.)

It was reported that tests based on continuous immersion in distilled water showed red lead coatings to be outstanding. It gave a good blister rating, with excellent protection to the base metal, as evidenced by low weight loss and slight visual evidence of attack on the steel, and penetration or undercutting observed at damaged areas were either negligible or slight. Under test conditions of continuous condensation, systems containing red lead or zinc chromate appeared to be the most outstanding, while those containing predominately iron oxide gave results which were least outstanding.

It was also reported that in continuous contact with either a neutral or alkaline-type insulation and in the presence of water, paint systems in which the pigments were predominately red lead and/or zinc chromate showed superior resistance to blistering. A number of protective coating systems were found to stand up under conditions of an environment of high humidity at relatively high temperature, or periodic wet-dry exposure. Regarding types of vehicles, it was stated that the red lead system which was formulated with a linseed oil vehicle offered more protection in most of the tests than the one formulated with a phenolic-modified alkyd.

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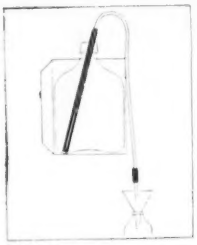

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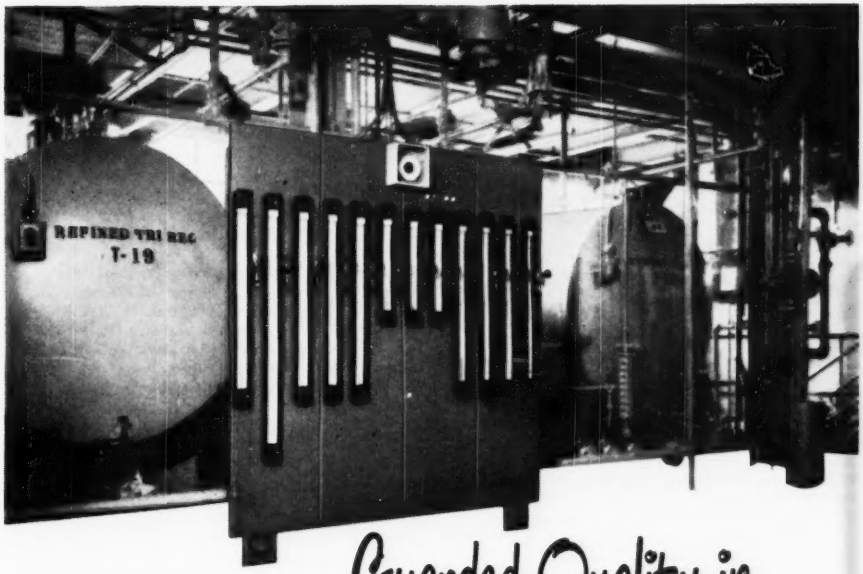

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NEWS of the Industry

NEW PLANTS

Announcement has been made of the formation of the **GENERAL COATINGS CORPORATION.** The company will manufacture industrial finishes in its newly constructed plant at 2001-25 Mendell Street, Chicago 14, Illinois. A complete line of product coatings will be available, with particular emphasis on materials formulated to the individual requirements of the customer.

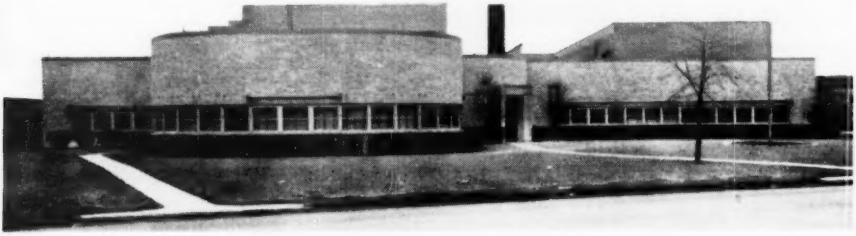
Heading the new company is W. Scott Ryan, and associated with his is Harry D. Bledsoe, both of whom have long been associated with the industrial finishing industry.

The general offices and plant of the **INDUSTRIAL FILTER & PUMP MANUFACTURING COMPANY** have moved from 1621 West Carroll Avenue to a newly acquired location at 5904 Ogden Avenue, Chicago 50, Illinois. The much larger manufacturing space provides facilities to meet the increasing demand for the company's filters, demineralizers, heat exchangers, corrosion test cabinets, unit spray washers, vulcanized linings, and molded-rubber products. This new plant will enable the company to better its service to its customers.

The new quarters of the nation's first industrial research laboratory, the **GENERAL ELECTRIC RESEARCH LABORATORY,** are nearing completion near Schenectady and soon will be fully occupied, it was announced recently by Dr. C. G. Suits, G-E vice president and director of research.

Exclusive of minor service buildings, the laboratory plant totals five buildings with a usable area of about 185,000 square feet. This includes the main five-story building with 160,000 square feet of usable space, the Radiation Laboratory where the 300,000,000-volt synchrotron and other atom-smashers will be installed, a low-temperature laboratory where helium is liquified for studying effects at temperatures near absolute zero, a chemical pilot plant to test chemical processes on a larger scale than possible in laboratory rooms, and others. There are shops for machine work, as well as for woodworking, welding, glass blowing, and electronics.

Purchase of the Pacific Chemical plant of the American-Marietta Co., Los Angeles, Calif., by **WYANDOTTE CHEMICALS CORPORATION,** producer of industrial chemicals and cleaning and



New home of the Industrial Filter & Pump Manufacturing Company

New plant of the Kirk & Blum Manufacturing Co., Cincinnati, provides the company with 100,000 square feet of manufacturing space, together with office and engineering facilities.

sanitizing compounds, has been announced by Robert B. Semple, president of Wyandotte.

Pacific Chemical's plant and sales personnel will be absorbed by Wyandotte's Pacific Division, and the Wyandotte research and technical service staffs, numbering nearly 200 persons, will become available to users of Pacific Chemical products as well as to compañies using Wyandotte products.

COMPANIES

The **GEORGE L. NANKERVIS COMPANY,** Detroit engineer and manufacturer of plating, buffing, and metal finishing equipment, has announced the purchase of the Electro-Mechanical Devices Company of Detroit, as a wholly-owned subsidiary. Electro - Mechanical Devices Company designs and builds dynamometers, control panels, test stands, and special machinery and products to serve the needs of the automotive and aircraft industries for production and quality control equipment.

The subsidiary company will be known as the Electro-Mechanical Devices Division of the George L. Nankervis Company.

The two companies are consolidating their facilities in a plant located at 19255 West Davison. The new building provides modern facilities for factory, research, engineering, executive and general offices.

George L. Nankervis, president, announces the appointment of Henry W. Grikscheit as vice president and director of the Electro-Mechanical Devices Division. H. M. Cherry, whose experience in the metal finishing field extends over 30 years, has been appointed vice president and director of sales of the plating, buffing, and metal finishing division.

Industrial division managers for all regions in the United States have completed an intensive conference at the home office of **DETREX CORP.,** Detroit 32, Mich. Technical information was released on the latest developments in the design, manufacture, and application of product cleaning and rustproofing processes, equipment and chemicals.

New plans for merchandising these items were covered.

New plant of George L. Nankervis Company and Electro-Mechanical Devices Division

(Top left), Behr - Manning carton for individual stone; (top right), individual telescope box; (bottom), standard package with reinforced corners.

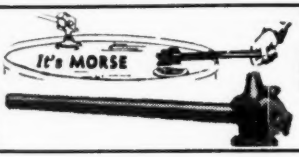
BEHR-MANNING (Division of Norton Company), Troy, N. Y., has announced a complete new "Service Packaging" of its Norton Abrasives Sharpening Stone line. Prompted and assisted by distributors and consumers, and developed through extensive market research, the new packaging is a welcome service contribution to rehandlers and consumers.

Behr-Manning cites the following improvements: (1) Adoption of standard label colors for each of its several stone families; (2) All labels and packages feature the revised Norton Abrasives and Behr-Manning trade marks to help customers identify products; (3) Labels on each individual stone are printed in reverse colors with light type against dark background for easier, faster reading; (4) Employment of a horizontal "3-stripe" box label treatment; (5) The wrap-around end label on an individual box features code number, brand name, size, on the end area; and quantity, grit, shape, on the side area; (6) Prominent display of stone specifications in bold type; (7) Standard package labels carry out the same themes in design and color; (8) Standard packages are natural craft boxes of neutral color and have metal strip reinforcements that prevent corner damage and ensure added protection in shipping and handling; (9) Labels on the corrugated shipping cartons are similarly changed to provide quick and complete product identification.

GOLD PLATING SOLUTIONS
In All Colors
Guaranteed 100% Pure Gold Content
Troy Weight - Color Constant
Tarnish Resistant
Proven Quality by the Acid Test
Write or call our experts about your plating problems
Davis-K-Products Co.
54 West 22nd St., New York 10, N. Y.
Oregon 5-0094
5-0095

Announcement has been made of the formation of the **CATALYTIC COMBUSTION CORPORATION** for the purpose of designing and manufacturing catalytic elements for use in fume incinerators and other air pollution control devices. The development and application of suitable catalysts for fume elimination is a

Send NOW for this FIT-ALL
DRUM PLUG WRENCH
Instantly loosens, tightens 95% all plugs or bungs in steel drums. Has 16" extra-strong steel tubing handle. Wgt. only 2 lbs. Order 1 or more today!



THOUSANDS IN USE saving time, labor, accidents!
SATISFACTION GUARANTEED... **$2.60**
Non-sparking type $4.00
Plus Parcel Post
MORSE MFG. CO., Inc.
124 Dickerson, Syracuse 2, N.Y.

result of a joint research project carried on during the past 4½ years by R. J. Ruff, president, Michigan Oven Company, Detroit, and H. R. Suter, associate director of research, Wyandotte Chemicals Corporation.

Manufacturing facilities have been leased in Wisconsin and production equipment installed, and sales are being handled through the company's headquarters at 4544 Grand River, Detroit 8, Michigan.

Officers of the company are R. J. Ruff, president, H. R. Suter, vice president, and N. C. Ruff, secretary-treasurer.

Waste-control measures that not only will curb pollution of streams but aid in conserving metals important to national defense are to be drafted by the metal-finishing action committee of the **OHIO RIVER VALLEY WATER SANITATION COMMISSION**, which met in Cincinnati on July 26. The committee is composed of representatives of top-management in the electroplating industries in the Ohio valley.

Walter L. Pinner, manager of research, Houdaille-Hershey Corp. of Detroit, and chairman of the committee, stated that better "housekeeping" methods, which will be outlined in a manual of plant practice for plating shops, will reduce pollutional discharges from some plants by as much as 50 per cent. This alone will represent an important contribution to stream clean-up efforts.

The metal-finishing group also appointed sub-committees to:

Evaluate present waste treatment methods—chairman, Hubert S. Kline, industrial hygiene engineer of General Motors Corp., Dayton, Ohio;

Outline ways of conducting plant waste surveys — chairman, William H. Toller, Jr., chemical engineer of Houdaille-Hershey Corp., Huntington, West Virginia;

Study toxicity potentials of various wastes—chairman, R. G. Collar, director of research, National Cash Register Co., Dayton, Ohio; and

Develop standard analytical procedures —chairman, William J. Neill, president of the American Electroplaters' Society, Columbus, Ohio.

NEW POSITIONS

New appointments in Hercules Powder Company's Synthetics Department are: **HENRY THOURON**, director of sales; **B. H. LITTLE**, district sales manager

Making a strong bid for a place at the top of the Industrial League (American Division) after a slow start, the KIRKER CHEMICAL COMPANY'S baseball team is working against exceptionally heavy opposition this season.

Seated left to right are K. Crane, H. Watson, J. Payne, E. Hassard, M. Passaretti, and L. Romeo. Standing, same order, are E. Gallagher, F. Della Torre, P. Bruno, R. Westergard, J. Close, T. Luyster, and M .Romeo.

Howard C. Bates (left), B. H. Little, Henry Thouron

of the department's Boston branch office; and **HOWARD C. BATES,** special sales representative in New England.

Mr. Thouron was assistant director of sales for the Synthetics Department from 1946 to 1949, and for the past year has been on special assignment at The Hague, Holland.

Mr. Little joined Hercules in 1928 as a chemist. He has been with the Synthetics Department sales staff since 1939, shortly after organization of the department, and has played a prominent role in the development of the sales of the department's products.

Mr. Bates has represented the Synthetics Department in New England since joining the company in 1941. In his new post he will be able to concentrate on a more specialized field than previously was possible.

FASTER, BETTER FINISHING with HARRISON'S NEW

4A

BUFFING *and* POLISHING COMPOUNDS

You send us a sample of metal used. We will return finished sample together with compound for your specific requirements.

Speed up production with correct compositions.

HARRISON & COMPANY, INC.

Haverhill, Massachusetts

E. W. Dany, chief engineer, Ferro Enamel Corp., Cleveland, Ohio, has announced the appointment of **C. L. WARNER,** Haller Oven Company, Pittsburgh, as sales representative in the western Pennsylvania territory. He will represent the company in the sale of industrial ovens, dryers, metal cleaning equipment, and complete synthetic finishing departments.

Also announced was the appointment of **S. F. HETTINGER** as sales representative in the Michigan territory for Ferro's Vedoc Industrial Organic Finishes. He attended the University of Louisville and has been identified with industrial finishing laboratory, sales, and service work for 14 years.

Appointment of **C. W. CRAIG** and **C. E. ERICSON** as manager and comptroller, respectively, of the North Chicago, Illinois branch of the Atlas Powder Company's Industrial Finishes Department has been announced by G. B. Work, departmental general manager.

At the same time it was announced that **CASPER APELAND,** formerly branch manager, has been named special representative for market research for both the North Chicago and Stamford, Connecticut plants. Mr. Apeland was one of the founders in 1919 of the Brevolite Lacquer Company.

Named as technical service manager in the paint spray division of The DeVilbiss Co., Toledo, Ohio, is **LEWIS W. LAMMIMAN,** a veteran of 25 years with the company. During most of those years he has traveled in the United States and Canada. He has also been a regular contributor to trade publications and has talked before many trade and technical

Lewis W. Lammiman (left), John W. Cochrun

groups in all parts of the country.

To concentrate other activities in all divisions of the company which come under customer service, DeVilbiss has set up the position of equipment service manager and has appointed **JOHN W. COCHRUN,** formerly with Bendix-Westinghouse Automotive Air Brake Company. He is a Purdue graduate with many years of experience in service training and administration.

Houghton Laboratories, Inc. Olean, N. Y., manufacturer of anti-corrosive metal primers and surface coatings, has appointed **JAMES L. FITZSIMMONS,** Belleville, N. J., as direct factory sales and service representative in the Metropolitan New Jersey and New York City area.

Glenn H. Friedt, president and general manager of United Platers, Inc., Detroit, has announced that **JAMES J. MALONE,** assistant general manager, has been promoted to vice president.

Mr. Malone is actively interested in the activities of the American Electroplater's Society and the Plating Institute.

FRANCIS E. FAIRMAN has been appointed general sales manager of Large Apparatus Divisions and **ARTHUR W. BARTLING** has been named general sales manager of Small Apparatus Divisions in the General Electric Company's Apparatus Department, according to announcements by John W. Belanger and Nicholas M. DuChemin, assistant general managers of the department. Both of the sales positions are newly established.

The appointment of **ALFRED N. YOUNG** as sales-service representative of Pennsylvania Salt Manufacturing's Special Chemicals Department in the St. Louis area was announced by Joseph J. Duffy, Jr. department sales manager.

Succeeding **CHARLES R. SORBER, JR.,** who was recently transferred to the Cincinnati territory, Mr. Young comes to Pennsalt from the Harrison Lumber and Hardware Company of St. Louis. Prior to that he was with the sales department of the Grasselli Division of E. I. duPont de Nemours.

Gerald G. Kraft, sales manager of Kraft Chemical Co., Chicago, Ill., has announced the appointment of **HARRY E. STOPEK** to a sales-service position, concentrating on metal fabricating and finishing.

Dr. G. Klinkenstein, president of Maas & Waldstein Co., Newark, N. J., has announced the appointment of two engineers to the company's Eastern division.

ROY S. BENJAMIN, who will concentrate on the eastern Pennsylvania area, which includes the southern part of New Jersey and Baltimore, has had 15 years' experience in research, development, and technical service of industrial finishes, as well as the installation and technical servicing of electrostatic spray equipment and infra-red and convection ovens.

FRANCIS A. CZECH will call on manufacturers using organic coatings in south central New York State, including the north central section of Pennsylvania. He possesses a broad technical

Francis A. Czech (left), Roy S. Benjamin

background and familiarity with industrial finishes, as well as electroplating techniques.

E. E. HOWE has rejoined Chicago Vitreous Enamel Product Company in a special staff assignment capacity.

Mr. Howe is well known in both the porcelain enameling industry and metallurgical field for the many talks he has presented and papers he has written and made available for publication.

Northwest Chemical Co., Detroit, Mich., manufacturer of Northwest and Alkalume Metal Cleaners, "Super-Draw" and "Fluid-Film" drawing compounds, has announced the appointment of **STEPHEN B. RANDOLPH**, a chemical engineer, as Eastern representative. His address is 321 East 43rd St., New York City.

Klem Chemicals, Inc., Dearborn, Mich., has announced the addition of two field service engineers to its staff.

FORM-A-ROC

FIRST-COAT

FOUNDATION

FOR FINE FINISH

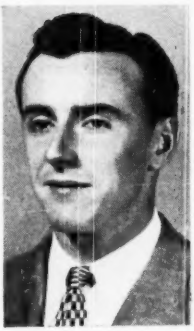
1. **Dries with lacquer speed.**
2. **Has double lacquer solids at spray gun.**
3. **Fills very well—sands easily.**
4. **Adheres tenaciously to steel, wood, presdwood, aluminum, galvanized metal, etc.**
5. **Holds out lacquer, synthetic or oleo-resinous enamels exceptionally well.**
6. **Thins 3:1 with xylol.**
7. **Available in GREY, SALMON and OFF-WHITE.**
8. **Ground well to smooth texture.**

MADE BY

The Varnish Products Company

5208 Harvard Avenue Cleveland, Ohio

RICHARD COLLINS will work out of the main office, and will service accounts in Detroit and the Flint and Saginaw section. He is a graduate of the University of Detroit in chemical engineering, and was formerly with the Harshaw Chemical Company.



Richard Collins

ROBERT FURROW will be Klem's Grand Rapids representative, and will service accounts in western Michigan. He was formerly associated with the Detroit Ordnance District and the King-Seeley Corporation.

L. L. Andrus, vice president of American Wheelabrator and Equipment Corporation, has announced the appointment of **ROBERT T. PRING** as technical director of the Dust and Fume Control Division.

After obtaining a B. S. Ch. E. from Tufts College in 1933, Mr. Pring completed graduate studies in industrial hygiene at the Harvard School of Public Health in 1935. Following a brief period as an engineer with the Employers Group, Boston, he became industrial hygienist for Utah Copper Company in 1936. For the next fourteen years he supervised industrial health and industrial ventilation work of that company, expanding his interests in 1947 to encompass all domestic mining operations of the Kennecott Copper Corporation.

Appointment of **JOSEPH E. RHOADS** as general manager of The Plating & Galvanizing Co., Cleveland 14, Ohio, was announced recently by Raymond L. Round, president. Mr. Rhoads will be in charge of all company operations, which include complete cadmium, nickel, brass, copper, and zinc plating facilities and hot dip galvanizing.

Prior to joining the company he was vice president of the Progressive Plating Corp., Elyria, Ohio, and was also formerly associated with the Brown-Lipe-Chapin Division of General Motors.

FRANK WATT has been appointed general sales manager of the Metal Finishing Equipment & Supplies Division of Frederic B. Stevens, Inc., Detroit, it was announced by W. H. Joseph Cluff, president.

Frank Watt

Mr. Watt, who is widely known throughout the plating industry, has been a member of the sales and engineering department of the Stevens organization for the past 17 years. In addition to his new duties, he will also continue to contribute of the engineering and design of Stevens plating equipment.

TRAINING COURSES

An evening lecture and laboratory course, Industrial Electrochemistry and Electroplating, will be given at the **BROOKLYN TECHNICAL HIGH SCHOOL** starting in September. There will be no charges involved in taking the course, which will cover basic chemistry, electrochemical principles, chemical analysis, and practical electroplating. Emphasis will be on laboratory work, wherein the students will carry out investigations in cleaning, electrocleaning, bright plating, and plating from all the commercial baths. Field trips to commercial plating plants and lectures by guest experts are also planned.

Anyone interested in taking this course should contact James P. Striffler, Brooklyn Technical High School, DeKalb Ave. & Fort Greene Place, Brooklyn, N. Y. Early registration is suggested, as the number of persons who can be accommodated may be limited.

SOCIETIES

Over 100 golfers participated in the International Fellowship Club's Annual Golf Tournament held at the Tedesco Country Club during the recent **AMERICAN ELECTROPLATERS' SOCIETY** Convention. Winners of the tournament and the prizes awarded them were: Walter Cibulskis, United Chromium, Inc., Detroit, (trophy); Mrs. C. W. Gore, New England Buff Co., Boston (golf bag); John Trumbour, "Metal Finishing," New York (traveling bag); Cliff Heckenberg, New England Buff Co., Boston (sport seat); Rudy Skriletz, H. B. Salter Mfg. Co., Marysville, Ohio, (golf balls); Harold Stevens, Towle Silver Co., Newburyport, Mass. (shag bag); Mrs. S. N. McNealy, Bacon Felt Co., Winchester, Mass. (gloves); Bob Feinberg, Beacon Supply, Chelsea, Mass. (gloves); and Joe Powell, Lewis Chemical Co., Lynn, Mass. (title of Most Courageous Golfer).

At a recent meeting of the Industrial Marketers of New Jersey, a chapter of the **NATIONAL INDUSTRIAL ADVERTISERS ASSOCIATION,** Bertram F. Ames, general sales manager of Maas & Waldstein Co., Newark, N. J., was elected to the position of vice president.

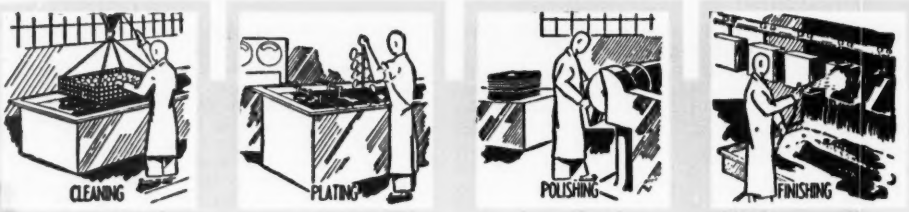
B. F. Ames

He is an active member of the American Marketing Association, the Advertisers Club of New Jersey, and the New York Paint, Varnish and Lacquer Association.

MEETINGS

THE 1950 INSTRUMENT CONFERENCE AND EXHIBIT, the fifth sponsored by the Instrument Society of America, will be held in the Memorial Auditorium, Buffalo, New York, from September 18 to 22.

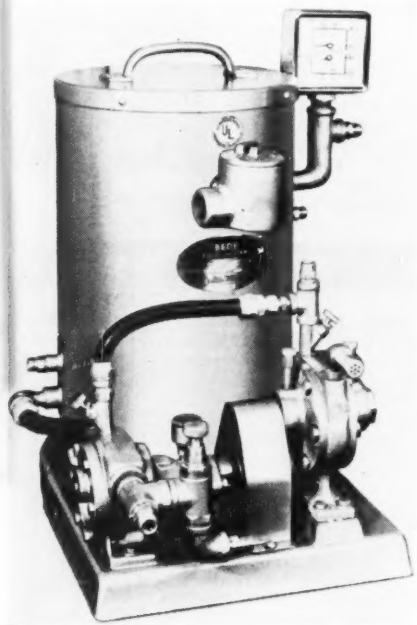
The **12TH ANNUAL FORUM** held by the Porcelain Enamel Institute for all individuals connected with or interested in the Pocelain Enameling Industry is scheduled to convene at the University of Illinois, Urbana, on September 13, 1950. The technical program to be presented September 13 through 15 includes papers on New Application Methods, New Product Development, and Quality Control.



New • EQUIPMENT • MATERIALS • PROCESSES

Bede Blowback Attachment

With the Bede Blowback Attachment, color changes and flushing of paint lines take only a fraction of the time formerly required. Easily installed on any Bede Circulating Paint Heater, it diverts compressed air to blow out paint lines. This attachment is manufactured by Bede Products Inc., 4311 Ridge Road, Cleveland 9, Ohio.



Bede Circulating Heater with Blowback Attachment

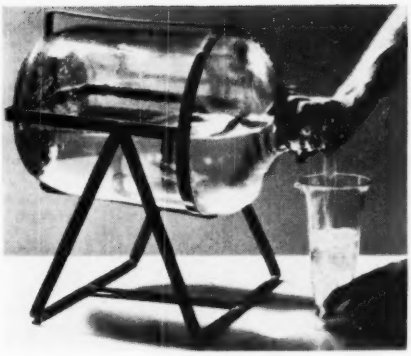
All unused finish in the system, usually flushed out with solvent and wasted, is returned to the original container or paint supply. Often the cleaning is accomplished so thoroughly it is unnecessary to follow up with flushing out the hose with solvent, it is stated. Any slight traces of paint remaining can be removed with a few sprays of the next color run.

According to the manufacturer, operation is simple and foolproof. Compressed air flushes the paint lines. One valve on the inlet side of the air motor (at right of picture) shuts off the air motor and pump. Opening a second valve (at left) permits compressed air to force the paint out of the pump, through the Paint Heater and the fluid hoses back into the original container. Thus, the complete system is emptied of paint, and all paint is returned to the container for future use.

Addition of the Blowback Attachment makes the Bede Circulating Paint Heater most versatile and practical. Paint can be drawn directly from original paint containers without the use of a pressure tank. The explosion-proof heater heats the paint to any desired temperature, generally to 180 deg. F. The Attachment, consisting of hose, valves and fittings, runs between the air motor and pump.

GS Tilter

The GS Tilter for 5-gallon bottles, designed to prevent accidents caused by



GS Tilter

spilling, splashing, and carelessness in pouring liquids, has been announced by the General Scientific Equipment Co., 2700 W. Huntingdon St., Philadelphia 32, Pa.

A chain is provided to hold the bottle in position when tilted. The cradle is made of steel, and all members are riveted or welded to ensure a strong and durable device for this purpose.

Barco Metal Degreaser Q 200

Barco Chemical Products Co., Dept. PF, 701 S. La Salle St., Chicago 5, Ill., has announced its recently-developed product, Barco Metal Degreaser Q 200, which quickly and thoroughly removes all oil, grease, waxes, and so on.

The fluid is used cold. Metals or plastics are degreased either by immersion of parts in the fluid; by dipping and brushing (where grease is extra heavy); or by wiping with the fluid. Parts with painted surfaces (with very few exceptions) can be degreased without harm to the painted surface, it is claimed

Barco Metal Degreaser is recommended for use in such industries as screw machine products, stampings, precision instruments, plastics, electrical equipment, and in the maintenance of production equipment, motors, elevator cables, and so on.

Elcometer Thickness Gage

Manufactured by Henry A. Gardner Laboratory, Inc., Bethesda 14, Md., the Elcometer Thickness Gage permits measurement of non-magnetic protective and decorative coatings applied to magnetic surfaces with an accuracy of plus or minus 5 per cent plus or minus 0.0001 inch.

Advantages claimed for the light weight, vest pocket size instrument include the following: (1) Spot checks can be made right on the production line. (2) Thickness can be measured at any point on large or small sheets. (3) Measurements are not restricted to flat surfaces; accurate readings can be obtained on small radiused curves to $\frac{1}{8}$-inch radius on a convex surface. Also, concave surfaces down to 1-inch radius, in shallow pressings, can be measured without difficulty. (4) Readings can be made in most inaccessible positions. (5) A pointer locking device is incorporated in the meter, and the instrument is balanced in all planes. Thus, a measurement can be taken in an area where the scale cannot be seen. The instrument then can be locked and brought into the open for accurate reading. (6) The unit is not limited in scope. Thickness of porcelain enamel, plating, paints, lacquers, tinning, foils, plastics, and so on, can be quickly and accurately measured by simply laying the sheeting over a steel plate or table. (7) The Elcometer is completely self-contained, and durably constructed of aluminum and stainless steel.

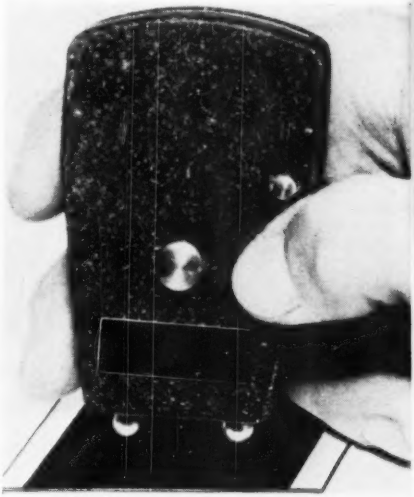


Illustration showing relative size of the Elcometer Thickness Gage

Detrex 53 Electrolytic Cleaner

An electrolytic cleaner for steel, brass, nickel, and die castings, Detrex 53 has been introduced by the Detrex Corp., Box 501, Detroit 32, Michigan.

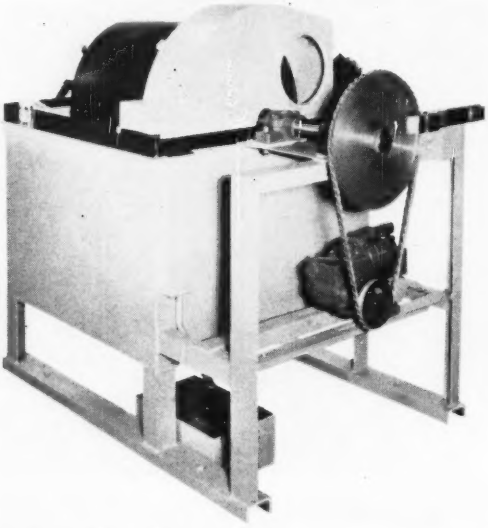
Features of Detrex 53 Cleaner, pointed out by the manufacturer, include the following: it cleans soft (non-ferrous) metals without attack; has high current-carrying capacity; is free from objectionable foaming and odor; rinses very freely; requires low make-up additions; does not contain soaps or resinates; and is 100 per cent inorganic and completely soluble in hot water at high concentrations.

Unichrome Chromium Plating Barrel

A 24-inch batch-type Unichrome Chromium Plating Barrel, used for hard and decorative plating of small parts which are difficult to plate in baskets or on racks, has been announced by United Chromium, Inc., 100 E. 42nd St., New York 17, N. Y. The insulated steel cylinder of the barrel is 24 inches in diameter and 20 inches long. The cylinder is mounted in a 150-gallon, insulated steel tank with all bearings, connections, and brush contacts made outside the barrel. The cylinder is rotated by an electric motor through reduction gears, while the anode is stationary inside the cylinder. A temperature control coil, electric stirrer, exhaust hood, unloading device, and drip pan are included.

The capacity of the barrel depends upon the size and shape of the work. Approximately 5,000 wood screws, ½ inch long, weighing 10 pounds can be chromium plated in 10 minutes.

A special Unichrome Self-Regulating High Speed Chromium Plating Solution is used in the barrel. Maintenance of the self-regulating solution is simple, water and Unichrome S.R.H.S. salts being the only additions necessary. Under normal operation, no chemical analysis of the solution is required. Additions are made on the basis of solution density determinations made with a hydrometer.



Unichrome Chromium Plating Barrel

Turco Air and Water Rinse Gun

Turco Products, Inc., 6135 S. Central Ave., Los Angeles 1, Calif., has marketed its air and water rinse gun. Precision built for maximum operating efficiency, it has a unique feature—the air and water systems are controlled independent of each other. With this feature, the operator can adjust either air or water spray to the most exacting degree.

Called the "Air and Water Rinser," the gun uses hot or cold water, connects to a regular air and water supply, has a built-in hang-up hook, and is engineered to eliminate troublesome back-splash. Built to comfortably fit the operator's hand, it makes difficult rinsing easy, almost effortless. The heaviest dirt and grease can be blasted from even the finest finish, safely and swiftly, it is claimed.

The rinser is recommended for use in rinsing after application of emulsion pre-cleaning, degreasing solutions, paint strippers, and other cleaning materials. It is adaptable to cleaning industrial equipment, paint spray booths, aircraft and aircraft equipment, automotive equipment, and a wide range of other cleaning operations.

Dyna-Grip

Dyna-Grip, a non-slip protective coating, has been marketed by The Merchants Chemical Co., Elm Court, Stamford, Conn.

Quickly and easily applied by brush to either damp or dry surfaces, Dyna-Grip dries rapidly and forms a tough permanent non-slip treading surface.

According to the manufacturer, Dyna-Grip surfaces are unaffected by temperature changes, and are highly resistant to acids, alkalies, gasoline, oil, grease, and salt water.

Poly-Kote Paint Bonding Process

Poly-Kote, for the treatment of iron and steel preparatory to painting, has been developed by Kelite Products, Inc., P. O. Box 2917, Terminal Annex, Los Angeles 54, California.

The manufacturer states that Poly-Kote eliminates the need for treating with chromic acid, and forms a dense smooth film of low porosity and high plasticity which cannot absorb paint excessively. The uniform, fine textured, crystal line coating can be controlled to provide a light or heavy paint-bonding film. Salt spray tests show superior resistance to rusting both on painted and unpainted work, it is claimed.

No expensive equipment is required for Poly-Kote, and immersion or spray application works equally well. It is non-toxic and non-flammable.

Hydrion Canister Demineralizer

Ideal for use in small scale electroplating operations and for spot location work, the C 51 L Hydrion Canister Demineralizer has been developed by A. E. Tomkin & Co., 1828 Columbia Rd., N.W., Washington 9, D. C. By direct attachment to the water faucet, distilled quality water can be had instantly by simply turning on the faucet.

No heat, cooling, or power are needed. The Hydiron utilizes disposable refills which, when exhausted, are merely discarded from the canister; the canister is then easily reloaded with a fresh refill charge.

The demineralizer is an ion-exchange water purifier developed for uses where mineral-free water is needed. The converted water can be drawn off continuously or when wanted.

IN ROLLS
Cut off any size piece and use as needed.

CUT BULK
Already cut and folded, ready to use.

NOW! Tack Cloth in Handy Rolls or Cut Bulk

Now you can get Tack Cloth packed the way it's easiest for you to use—either in 150 yard rolls of 36" wide cloth or in handy cartons—100 or more Tack Cloths to the carton.

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— A WARRANTY OF SATISFACTION IN EVERY CARTON —

PRODUCT LITERATURE

The publications listed in this section may be obtained free upon written request on company letterhead to the manufacturers concerned. Your courtesy in mentioning PRODUCTS FINISHING when requesting copies of these publications will be sincerely appreciated by the manufacturer and the publisher of this magazine.

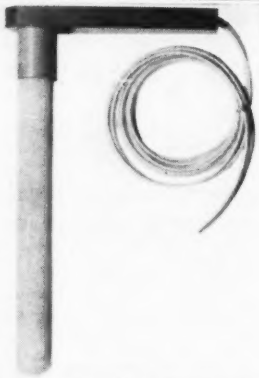
Engineering Properties of Nickel Alloys. Two technical bulletins on the properties of high nickel alloys have been issued by The International Nickel Co., Inc., 67 Wall St., New York 5, N. Y. Both are twenty-four pages in length and contain charts, tables on compositions and properties, working instructions, and other information of a technical nature.

Technical Bulletin T-7 is entitled "Engineering Properties of Inconel". In addition to information on Inconel, it contains material on Inconel "X", one of the newer age-hardenable Inco nickel alloys. **Technical Bulletin T-9** deals with the engineering properties of "K" Monel and "KR" Monel.

H-VW-M Wes-X Bright Copper Plating Process. The Hanson-Van Winkle-Munning Co., Matawan, N. J., has available a 16-page bulletin presenting technical instructions for the H-VW-M Wes-X Bright Copper Plating Process with PR current plating or direct current plating.

Bede Circulating Paint Heater. A circular, data sheet, and price list providing operating characteristics, features, and advantages of its Circulating Paint Heater can be obtained from Bede Products Inc., 4311 Ridge Rd., Cleveland 9, Ohio.

Use of Chromic Acid in the Metal Finishing Industry. Fiber Chemical Corp., P. O. Box 218, Matawan, N. J., has available to those requesting on company letterhead the first four bulletins of an extensive bibliography they are preparing on the use of chromic acid in the metal finishing industry, as follows: **Bulletin B 11** (chromium plating); **Bulletin B 12** (anodizing of aluminum); **Bulletin B 13** (electropolishing); and **Bulletin B 14** (metal finishing).



Corrosion-Resistant Immersion Heater for Electroplating Solutions

The electric immersion heater illustrated is widely used in heating plating and pickling-tank solutions. Its advantages include quick, clean heating, minimum-space requirements and simple installation.

These units also have proved a great convenience in heating small tanks and pots and in their ability to be readily transferred from one job to another.

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MIRACLE
5 GALLON
PAINT REJUVENATOR

All paint restored to original consistency without opening the can.
2 minutes per gallon.

MIRACLE PAINT REJUVENATOR CO.
128 E. 10th St., St. Paul 1

Plating Rack Folder. A 12-page folder illustrating and describing distinctive features of the NaRaCo plating racks has been issued by the National Rack Co., Inc., 396 River St., Paterson, N. J., and Imperial Plating Rack Co., Inc., 1613 Industrial Ave., Flint, Michigan.

NYB Type ME Fan. Bulletin 495 has been prepared by The New York Blower Co., 3166 S. Shields Ave., Chicago 16, Ill., to aid those interested in the proper selection of multi-blade centrifugal fans. Illustrated throughout, the 32-page bulletin contains general useful engineering data.

"Proving Ground for Production" is the title of an eight-page two-color bulletin prepared by Behr-Manning, Troy, N. Y., illustrating and describing the Behr-Manning Methods and Equipment Demonstration Rooms located in or near all industrial centers. Some typical case histories of better methods developed by Behr-Manning engineers are cited.

Imperial Water Rinsable Remover, designed especially for removing tough finishes from metal surfaces, is the topic of a leaflet issued by the Wilson-Imperial Co., 115 Chestnut St., Newark 5, New Jersey.

Recording Thermometers. The Bristol Co., Waterbury 20, Conn., has published a 44-page bulletin giving complete information on its "Series 500" line of thermometers. Liquid-filled, vapor pressure, and gas-filled types are described in models for recording, indicating, controlling, and telemetering of temperatures. Each of the types of thermometers is fully described, with information given on operating principles, characteristics of operation, temperature sensitive bulbs, recording charts, and accessories. Resistance type thermometers, humidity instruments, and time-temperature controllers are also described. In addition to numerous photographs, **Bulletin T840** is liberally illustrated with reproductions of actual temperature chart records and sketches of applications to enhance its value as a handbook of industrial thermometry.

It costs more per pound. But it cleans better, goes farther, cleans more surface per pound of cleaner; it's an economical buy.

Parco Cleaners are specially formulated to clean and condition metal surfaces to provide a better base for finishes. They're formulated to reduce cleaning time, operating temperatures, and amount of cleaner used.

In the Parco Cleaner line there's bound to be one that's especially suited for your requirements. A production test with the Parco Cleaner that fits your need will save you money on cleaning. Write today!

- **Emulsion and Solvent Type**—Excellent for removing oil, grease and soil from metal surfaces. Spray and immersion types.
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BONDERITE—Corrosion Resistant Paint Base • PARCO COMPOUND—Rust Resistant
PARCO LUBRITE—Wear Resistant for Friction Surfaces

Porter-Cable Wet Belt Surfacer. Products of the Porter-Cable Machine Co., 1708 N. Salina St., Syracuse 8, N. Y., Model BG-8 Wet Belt Surfacer with automatic feed table is described and illustrated in an eight-page two-color catalog. Features and specifications, together with case histories, are presented.

Unichrome Stop-Off Lacquers. United Chromium, Inc., 100 E. 42nd St., New York 17, N. Y., has issued a four-page leaflet describing its three fast drying stop-off lacquers. Briefly described also are other Unichrome Insulating Materials.

Suggested Formulations for Surface Coatings. American Cyanamid Co., Coating Resins Dept., 30 Rockefeller Plaza, New York 20, N. Y., has announced the first seven of a series of technical bulletins devoted exclusively to data on suggested formulations for various types of surface coatings. A separate bulletin, punched for convenient binding, is devoted to each of these subjects: low-bake furniture finishes, baking undercoats, washing machine enamels, refrigerator enamels, heat-resistant enamels, white appliance enamels, and metal furniture enamels. Based on extensive research and evaluation in the company's Stamford, Connecticut laboratories, each bulletin contains a suggested formulation, an analysis of the finish when so formulated, recommended application procedures, and data on film properties.

AMER-glas Replaceable Type Air Filter, for forced air heating, ventilating, and air conditioning systems, is the subject of **Bulletin No. 211** released by the American Air Filter Co., Inc., Louisville, Ky. Complete installation data are presented.

Buffs and Polishing Wheels. The Bias Buff & Wheel Co., Division of Riegel Textile Corp., Hudson Blvd., Jersey City 7, N. J., has prepared a 24-page handbook and catalog of the Bias Buff and other special buffs for industry. On the various pages are shown different styles for achieving the best results in finishing metal surfaces. Other items relating to buffing and polishing are also featured.

ELECTROPLATERS' CALCULATOR 40c
PLATING WEIGHT COMPUTER 30c
Both for 60¢ Postpaid.
Send check or postal note.
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Schaffner Mfg. Co., Inc. Emsworth, Pittsburgh 2, Pa. Rosewood 1-9902

McKeon's
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"THE OXIDIZING AGENT OF TODAY"
For stripping copper and producing various oxidized finishes on copper and silver.
Economical. Simple to use.
Order 5 gal. on trial and approval
Sulphur Products Co., Inc.
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For a real good polishing job use
Keystone TURKISH Emery
FRESH SUPPLY AVAILABLE
KEYSTONE EMERY MILLS *Write for Sample* 4316 Paul St., Phila., Pa.

Simplified Paint Spray Booth Maintenance. An interesting discussion of how specialized materials and methods permit simplified maintenance of water wash paint spray booths is provided in a Service Report issued by Oakite Products, Inc., 120 Thames St., New York 6, N. Y. The report describes specific materials and procedures that (1) prevent paint droplets from coagulating and adhering to metal spray booth surfaces; (2) help protect pumps, lines and nozzles from clogging, and (3) reduce the frequency and difficulty of maintenance clean-up operations.

In addition to reviewing materials and methods said to allow longer operation of paint spray booths between regularly scheduled maintenance cleaning operations, the Service Report also offers specific recommendations for combating excessive foaming of paint spray booth solutions.

Elcometer Thickness Gage. Henry A. Gardner Laboratory, Inc., Bethesda 14, Md., has available a leaflet descriptive of its lightweight vest pocket size dry film thickness gage, which permits measurement of non-magnetic protective and decorative coatings applied to magnetic surfaces.

NARACO RACKS
with Replaceable Tips
FOR EVERY NEED

Body of plating rack is a "permanent tool" and "vulnerable" tips are replaceable. These work holding tips can be removed and replaced in less than two minutes.

Write for further information.

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Mid-Western Area — **IMPERIAL PLATNG RACK CO.**
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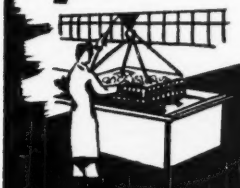
PHOSPHATING BATH
IRCO 66



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- No troublesome sludge
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- Produces all standard weights of zinc phosphate coatings
- Used with all ferrous metals — excellent base for organic finishes
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The Finishing Touch — **By J. A. Patterson**

"It's a pretty difficult spray job!"

Opportunity Section

WANTED—for State of Wisconsin—sales representative for product finishes—technical background preferably from a production finish laboratory. Selected candidate will be backed with a line of high quality specialties, an excellent technical staff, a successful aggressive rapidly growing company strategically located. Application by letter only, state qualifications and background in detail.

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Will BUY your dirty THINNERS and SOLVENTS. Send sample or letter giving approximate contents and solids. The Johann Company, Room 416, 1180 E. 63rd St., Chicago, Ill.

LACQUER CHEMIST WANTED

Chemist experienced in the formulation of industrial lacquer products. This is an excellent opportunity to work with congenial associates in the AAA-1 company located in the east. Please write in detail. All replies confidential. Our personnel have been informed of this ad. Reply Box No. 82, c/o PRODUCTS FINISHING, 431 Main St., Cincinnati 2, Ohio.

Salesman for lacquers and enamels by national manufacturer for Detroit territory. Write Box No. 86, c/o Products Finishing, 431 Main Street, Cincinnati 2, Ohio.

Salesman for lacquers and enamels by national manufacturer for Los Angeles territory. Write Box No. 85, c/o Products Finishing, 431 Main Street, Cincinnati 2, Ohio.

FOR SALE

One (1) used Trumbull Raymersion Oven, approximately 12' long and one (1) used Matthew Level Trolley Conveyor approximately 36' overall length. Both in excellent condition and can be seen in operation. For full details, write: Art Metal Works, Inc. (Pa.), 250 Harris Street, East Stroudsburg, Pa.

PAINT DEMONSTRATOR

Midwest firm manufacturing complete line of industrial finishes needs experienced service man. Very attractive position with old established company. Our men have been informed. Box No. 83, c/o PRODUCTS FINISHING, 431 Main St., Cincinnati 2, Ohio.

Industrial Finishes Salesmen Wanted

Large manufacturer of all types of industrial finishes with a new plant in the midwest has attractive sales positions open for qualified men with a following in Detroit, Cleveland, Chicago and the surrounding areas. Please apply in writing giving full details to Box No. 81, c/o Products Finishing, 431 Main St., Cincinnati 2, Ohio. Replies confidential. Our men know of this ad.

FOR SALE

38 Station full automatic Stevens rack Type machine for zinc.

6,000 amp., 12 volt, Chandeysson generator.

5,000 amp., 9 volt, Chandeysson generator.

3,000 amp., 6 volt, Bennett-O'Connell generator.

Filters and dryers.

Numerous tanks, racks and other equipment also available.

CAN BE SEEN IN OPERATION NOW.

Write Box No. 84, c/o Products Finishing, 431 Main St., Cincinnati 2, Ohio.

Catalogs

FOR YOUR LIBRARY

To obtain copies of the catalogs listed here, indicate on the coupon the number of the item in which you are interested and mail as directed.

1. Metal Cleaners

Bulletins on cleaners for zinc base die castings, aluminum (both etching and non-etching types) steel, brass, tin, and lead alloys are available from Enthone, Inc., New Haven, Conneticut.

2. Acid-Proof Construction

A catalog discussing its complete facilities for designing, engineering, material selection, erection and maintenance of acid-proof construction for all industries is available from Chemsteel Construction Co., Inc., Pittsburgh, Pennsylvania.

3. Black Finishes

A "Black Book" describing details of Zinc Black and other Black-Magic metal finishes has been published by the Mitchell-Bradford Chemical Co., Stratford, Bridgeport, Connecticut.

4. Bright Zinc Plating

Bright zinc plating in barrels is the subject of a bulletin issued by the Hanson-Van Winkle-Munning Co., Matawan, New Jersey.

5. Plating Rack Paste Insulation

The Nelson J. Quinn Co., Toledo 7, Ohio, has available a folder descriptive of Bunatol 1002, a paste insulation designed to insulate hooks, fixtures, jigs, baskets, grids, and racks used in plating, its application and use.

6. Backstand Belts

"Facts About Backstand-Belt Grinding and Polishing" are enumerated in a booklet being distributed by Armour & Co., Chicago 9, Illinois.

7. Buffing and Polishing Compounds

The Mosher Co., Chicopee, Mass., has available a pocket-size guide for purchasers of buffing and polishing compounds which provides suggested uses for many Moco Compounds and lists other products and services of the company.

8. Grinding and Polishing Equipment

Specifications and operating data of its complete line of grinders, polishers, buffers, and speed lathes are included in Catalog No. 44 prepared by the Standard Electrical Tool Co., Cincinnati 4, Ohio.

9. Infra-Red Ovens

The Fostoria Pressed Steel Corp., Fostoria, Ohio, has prepared Bulletin EV-M149-10 which presents in detail advantages to be gained through the use of Fostoria "Evenray" Heating Equipment. The ovens are described feature by feature, and characteristics of the equipment are outlined.

10. Scratch Brushes

Dixrip Fine Wire Scratch Brushes for all industrial purposes are described and illustrated in a catalog and price list available from Dixon & Rippel, Inc., Kingston, New York.

11. Gold Plating

An instruction booklet describing gold coloring solutions for various shades of gold is now being issued by Baker & Co., Inc., Newark, New Jersey.

12. Felt Polishing Wheels and Accessories

Bacon Felt Co., Winchester, Mass., has an illustrated brochure listing its complete line of felt polishing wheels, bobs, sheets, hair felt, and marble buffers, together with specifications and suggested applications.

13. General Purpose Fans

"General Purpose Fans" is the title of an eight-page bulletin designated as Bulletin 491 distributed by the New York Blower Co., Chicago 16, Illinois.

14. Flock Color Card

A color card containing samples of flock finishes has been issued by the Rayon Processing Company of Rhode Island, Inc., Central Falls, Rhode Island.

15. Metal Lacquers

"Is There A Better Metal Finish Than The One You Now Use?" is a booklet issued by The Egyptian Lacquer Mfg. Co., Newark, N. J., describing six clear lacquers for metal.

16. Chemifinishes

General information concerning the finishing of metals with Du-Lite materials is contained in literature prepared by The Du-Lite Chemical Corp., Middletown, Connecticut.

17. Electric Heating Units and Equipment

Prepared by the Edwin L. Wiegand Co., Pittsburgh, Pa., Catalog 50 lists a wide variety of standard electric heating units and equipment, together with easy selection and application data.

18. Temperature Controls

Self-operated temperature controls for plating and finishing applications are described in Catalog No. 600 available from the Sarco Co., Inc., New York 1, New York.

19. Deburring and Finishing Equipment

"Cut Labor Costs ½ or More" is the title of a bulletin issued by Almco, Division of Queen Stove Works, Inc., Albert Lea, Minn., describing the complete line of Supersheen deburring and finishing barrels, equipment, and supplies.

20. Striplastic No. 320

A bulletin describing the properties and applications of Striplastic No. 320 is available from the Striplastic Co., Cleveland 6, Ohio.

21. Cleaning and Phosphatizing

Four convenient reference file folders under the headings of Paint Removal, Phosphate Coatings, Metal Cleaning, and Spray Booth Maintenance, which contain descriptions of the complete line of various compounds and chemicals available from the company, can be obtained from Klem Chemicals, Inc., Dearborn, Michigan.

22. Paint Heater

Bede Products Inc., Cleveland 9, Ohio, has prepared a four-page illustrated circular describing operating characteristics, and advantages of its Paint and Air Heater for use in the hot spray process for lacquers and other organic finishes.

23. Finishing Equipment

The Despatch Oven Co., Minneapolis 14, Minn., has prepared Bulletin 51-C which illustrates and describes its complete line of gas-oil, electric, and steam finishing equipment.

24. Iridite Alcote

Allied Research Products, Inc., Baltimore, Md., has available a folder describing its Iridite Alcote, a chromate type, corrosion resistant finish for aluminum.

25. Semi-Automatic Polishing and Buffing Machines

Acme Mfg. Co., Detroit, Mich., has available a 20-page two-color bulletin including descriptions and illustrations of its Semi-Automatic Polishing and Buffing Machines, together with line drawings and complete specifications.

26. Cowles SO Cleaner

"Buffing Compound Removal Was A Tough Job!" is the title of a booklet describing the characteristics and advantages of Cowles SO Cleaner, product of Cowles Chemical Co., Cleveland, Ohio.

27. Abrasive Grain

The Simonds Abrasive Co., Philadelphia 37, Pa., is issuing an illustrated data sheet on "Borolon" Aluminum Oxide Abrasive Grain for the polishing trade and general industrial uses.

28. Activated Carbon

The use of activated carbon for decolorizing, purifying, and deodorizing various liquids and electroplating solutions is described in literature available from the Darco Corp., New York 17, New York.

29. Spray Painting Information

"Hints on Finishing Economies," a 20-page booklet prepared by E. I. du Pont de Nemours & Co., Finishes Div., Wilmington 98, Del., covers the following subjects: proper paint temperature, correct air and fluid pressures, importance of paint viscosity, gun adjustment for correct spray pattern, proper handling and triggering of the spray gun, uniformity and thickness of the paint film, and causes and cures of common imperfections in spray finishing.

30. Boothcote Circular

A circular describing the use of Boothcote, a spray booth coating, is available from the Hygrade Food Products Corp., Boothcote Division, Buffalo 6, New York.

PRODUCTS FINISHING
431 Main St., Cincinnati 2, Ohio

I am interested in receiving the following literature reviewed in your August Issue.

No...... **No.**..... **No.**..... **No.**..... **No.**.....
(Insert numbers denoting literature you want)

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• When you order Stevens compositions, you can be sure of getting the same high quality time after time. Because Stevens Quality-Controlled compositions never vary—in quality, content or size.

Stevens polishing and buffing compositions are manufactured with scientific precision in the world's most modern composition plant. Raw materials are all laboratory-tested before they are accepted for use by Stevens.

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It is no wonder—with all these protective measures—that Stevens compositions are universally accepted as the finest in the industry. For better results in your polishing and buffing compositions, try the Stevens way of quality and uniformity. It will pay in added value and performance. There are Steven compositions for every surface—every application.

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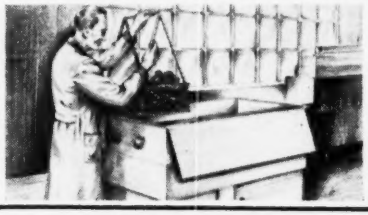
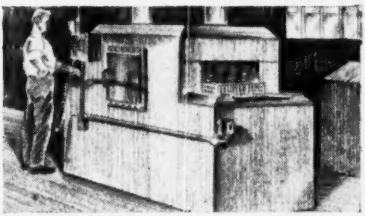
. . . he's your *Detrex* Field Engineer!

Degreasers		● if you need a degreaser, Detrex will design and build—a hand-operated unit, a high-production conveyorized machine, or a special complete process for your application. As for solvents . . .
Degreasing Solvents		● if you clean mixtures of non-ferrous metals, there's Perm-A-Clor, the highest stabilized degreasing solvent. For lowest-cost degreasing of ferrous metals, it's Triad. Now . . .
Metal Parts Washers		● if your job demands a metal parts washer, there are efficient Detrex machines designed to use alkaline cleaning compounds, spirits, or emulsions. In every installation you get maximum economy, extra long life, and complete satisfaction. There's a . . .
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